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A Machine Shop Whose Splendid Lighting Permits Efficient Production 24 Hours a Day. Note the Excellent Illumination on All Machines and Work Benches and the Absence of Deep Shadows.

How Lighting Interests Can Best Serve the Nation

Lighting Men, Though Hard Hit by the War, Owe It as a Patriotic Duty to Help War Industries and Others to Secure General Improvement of Factory Lighting

By F. H. BERNHARD

THE favorable turn of recent events in the world war attests the value of the material help and enthusiastic backing we are bringing to our hard-pressed Allies. It also demonstrates that the more intensive is American participation in the war the more quickly and surely will it be terminated by the enduring peace that the entire world has longed for so patiently. The loyal readiness with which each wish or suggestion of our Government is carried out shows how fully the American people realize that the primary business of the country now is conduct of the war and that everything that does not directly or indirectly aid in its prosecution must give way to whatever is vitally essential to this end.

Of all business interests the electrical industry as a whole has been prominent in adjusting its affairs to the needs of the nation. Many difficulties have been met and normal development turned into those channels that actively aided the Government. Electric lighting interests, however, seriously beset by curtailment in several classes of lighting, have in many cases been at a loss as to what they could do to help the country in its hours of need. It has been customary at this season of the year for those interests to survey the field, familiarize themselves with the latest progress of the art and determine in what lines development work holds forth the greatest promise. At present, with continuance of daylight saving and revival of lightless nights, the outlook at first looks very unpromising. It need not prove to be so, however. In

Beef Cooler in Large Meat-Packing Plant. Good Lighting in Plants Handling Food Products Promotes Sanitary Conditions as Well as Efficiency.

fact, in most cities there are numerous opportunities for improved lighting, development of which will serve the nation by helping it to win the war without appreciably increasing the difficulties of the fuel situation. The greatest of these opportunities is the betterment of industrial lighting and to point out the importance of this sadly neglected field is the main object of this article.

Primary Lighting Needs of the War.

To everyone that wants to uphold right over might winning of the war takes precedence over every private or selfish interest. Every industry must direct its efforts into lines essential to this end. Its first question should be, what is essential to the war? Lighting has an important bearing on the war, the primary needs of which in this respect are two: (1) Lighting of military and naval establishments; (2) lighting of industrial plants so they may promptly and amply supply the manifold needs of the army and navy.

The first has been taken care of directly by the proper authorities, who have seen to it that abundant and suitable light has been provided for cantonments, embarkation camps, docks, fortifications, navy yards, signaling service, etc. Extremely varied as these lighting needs have been, many of them being of special technical nature, they have received careful study and substantially all the requirements have been met both as to amount of light supply and its character.

The second set of lighting needs has been left to the initiative of the industrial plants themselves. A booklet of suggestions on improved industrial lighting was issued by an advisory committee of the Council of National Defense to plants engaged on important war supplies, but the execution of these excellent suggestions was left entirely to the option of the plant owners and managers. Many of the more progressive ones, especially those who had undertaken large contracts for which night operation with two or three shifts per 24 hours was necessary, were quick to see the value of the best possible lighting and consequently had their plants equipped with the most modern and efficient lighting equipment available. In several cases illuminating engineers were engaged to design the lighting system and solve intricate illumination problems, the cost of the special service being quickly repaid by the excellence of the results obtained. One of the interesting features brought out from this practice is the fact that it is readily possible to provide an artificial lighting system whose illumination will equal that available in the factory under the best daylight conditions, so that the rate and quality of production at night may fully equal that by day.

The steady growth of our military organization during the last 17 months has called for a very rapid increase in the supplies needed for the army and navy. The vast shipbuilding program and other activities directly connected with prosecution of the war have further extended to enormous proportions the Government's varied needs that must be supplied by industries located in all parts of the country. Consequently contracts for munitions and miscellaneous war supplies have been placed with industrial plants of almost every description. It is coming to be almost an exception to find a factory of any importance that is not engaged in turning out supplies directly or indirectly needed by the Government. This marshaling of the country's industries for national service is one of those broad-gauge measures like the draft which is bringing the war home to all communities and all classes.

However, it is impressing into most important service large numbers of plants poorly equipped in regard to illumination in comparison with the large munition plants that have been so active for a year

or more, especially in the East, and that have found greatly improved plant lighting to be essential to production on a war-time scale. If these more scattered and usually smaller plants are to meet the war's needs promptly and adequately, the importance of better lighting must be impressed on them and particularly for the timely reasons to be discussed below.

Secondary Lighting Needs of War.

Little argument should be needed to convince the owners of factories actively engaged on war work that improved lighting is needed if their establishments are not to be handicapped during the shortened days of the oncoming fall and winter. But what about the factories connected with the less essential industries? Is improving of their lighting non-essential? The writer believes that it may be slightly less essential, but in only a few cases is it non-essential.

The Government has adopted the prudent policy of giving priority to those industries essential to successful conduct of the war and of non-interference with all other industries as long as their demands do not conflict with the needs of the war. Voluntary enlistments and the first draft of men between the ages of 21 and 31 have necessarily interfered with the labor supply of all industries; extension of the draft limits to 18 and 45 is bound to increase the labor shortage and the consequent employment of women and possibly disabled soldiers. Where large numbers of untrained employes are engaged there are bound to be countless mistakes and accidents unless they are working under the most favorable conditions, one of the most important of which is ample light to do the work in hand properly and safely. Therefore continuance of the poor industrial lighting conditions now generally prevailing can, under present circumstances, produce only much needless suffering and inexcusable inefficiency and waste.

If there ever was a time when inefficiency and waste were a detriment to the country it is now when every element of man power and material resource is needed to win the war. Poor industrial lighting means that more workers are needed to turn out a certain product than if they could work with the higher efficiency made possible by improved lighting and its superior visual conditions. Poor lighting also means much wastage of materials due to products spoiled because of inability to see the work properly. The needs of the war call for conservation of men and materials to the greatest possible extent and especially by those industries that contribute only remotely to the war. Consequently, improvement of industrial lighting in general, and including the so-called non-essential industries, constitutes the secondary lighting need of the war. The only exception that comes to mind is that of the liquor industry, which in all likelihood will go out of existence through national prohibition within a year.

Of other branches of lighting it is not necessary to speak. Some, like sign, display, and decorative street lighting, are under official taboo on "lightless" nights. The spell of light curtailment has unfortunately also fallen on several other fields of lighting activity probably for the period of the war. Although this subject was actively discussed last winter by the Illuminating Engineering Society and the conclusion reached that the fuel saving thereby effected was very small in comparison with other means of conserving much now wasted fuel, there is little need for further

Weaving Colored Silks in an Eastern Silk Mill. These Very Fine Threads Are Woven with as Great Speed and Accuracy by the Artificial Light Here Provided as by Daylight, Though the Former Differs from Daylight Very Radically.

consideration of the matter. We have reached that stage of the war's progress where everybody has to make many sacrifices for the country's welfare. That which is essential is encouraged and all else not essential to the war may wait until more favorable times for resumption of normal development. In industrial lighting, however, we have an avenue wherein most of the energies usually spent in several other lines of lighting development can be concentrated advantageously for the country's unquestionable good.

Why Special Development of Industrial Lighting Is Particularly Timely.

It has already been shown that the country's immense war needs are of prime consideration and their urgency brooks of no humanly avoidable delay. Improved industrial lighting promotes efficiency and speeds up production. It is needed for this reason regardless of the season.

But we have now been working during summer months when little heed is given to the need for artificial lighting unless the plant works both day and night; especially has the subject been almost forgotten because we have enjoyed for over five months daylight saving with the additional hour of daylight in the evening. The time is close at hand when in spite of this the shortening days will begin to darken the factories before usual quitting time and after the last Sunday in October, when we shift back the hour of the present summer-time schedule, we shall suddenly be impressed with this fact very forcibly. If effective artificial lighting is not then available, the daylight will be seriously missed, production retarded, materials spoiled, accidents increased and the other evils of gloomy workshops suddenly brought to our attention. Clearly now is the time to prevent the oncoming trouble unless we delight in being unprepared. It should be emphasized also that overtime work and operation with two or even three shifts per 24 hours is becoming more and more imperative. The need for the most intense production requires utilizing plant equipment to the utmost every hour of the day.

Many lighting men believe that the campaign for improved industrial lighting should be a continual one, because the need for improvement is so general and so great that it will take a long time indeed to modernize factory lighting generally. But now evidently is the psychological time to redouble efforts in this line because these added efforts will bring most fruitful results, this being the time when it is easiest to impress the prospect and stir him to definite action. It must be remembered, though, that no single campaign, however successful it may be, can for all time produce ideal factory lighting. Not only is it physically impossible to revolutionize lighting conditions in any short interval, but the continual progress of the lighting art is found to make obsolete in a few years what now is looked upon as the acme of perfection.

The history of lighting development has shown that what was regarded as amply satisfactory in effectiveness and efficiency has quickly been outstripped by the continued improvements and new inventions in lamps and accessory lighting equipment, so that new standards and ideals are being set from time to time. The superior results obtainable from such developments will make it expedient in possibly from three to five years to go over the lighting system and make changes that will again quickly repay themselves. Similar developments in machine tools and other shop equipment are requiring frequent replacements to maintain the highest attainable efficiency. There need be no fear, therefore, that the possibilities of the industrial lighting business will be exhausted by a concerted campaign.

Of the various interests that have to do with lighting those that have been most active in stimulating

Another Machine Shop in Which the Artificial Lighting Provides Even Better Light Distribution at Night Than by Daylight. In a Shop as Well Lighted There Are No Troublesome Shadows Nor Dangerous Pitfalls.

Illumination of Large Color Presses in Big Printing Plant That Permits High-Speed and High-Quality Production at any Hour of the Day.

improved industrial lighting are practically all the lamp companies, most manufacturers of reflectors, special fixtures and related lighting equipment for factory use, and certain of the more progressive central stations. These interests have realized that this development is about the only big possibility in the lighting line during the continuance of the war and that pushing it is not only a means of keeping the lighting business out of a deep rut, but a patriotic duty to the country. Few industries that have been hard hit by the war have such an opportunity to serve a noble cause and at the same time offset the losses due to the slump in most lines of their business.

While the interests named above have been active for some time, other interests that can profitably aid in this campaign have so far done relatively little. Among these are many jobbers whose salesmen call on large industrial plants, many central stations that serve factories in their respective communities, and a great many electrical contractors and dealers who can find in this field a means of tiding over the slump in new construction work.

These interests should realize that the average factory owner or manager will not come to them with an appeal to have his lighting system modernized. He is content to leave well enough alone as he sees it. He must first be aroused from his lethargy and convinced that better industrial lighting is a splendid investment that brings excellent returns in increased production, reduced spoilage, decreased accidents and greater contentment among the workers. Once impressed with this fact, at least sufficiently to allow part of his plant to be equipped, he will become an ardent advocate of better lighting.

Much has been written relative to the arguments for better industrial lighting and the advantages it brings. Progressive manufacturers of lamps, reflectors, etc., have issued numerous bulletins, booklets and other illustrated matter in which the subject is discussed pithily and effectively. These can be obtained from those manufacturers. Numerous articles have appeared in the technical and industrial trade press covering the subject in a more or less general way. The writer has prepared a series of illustrated articles in which this matter is discussed somewhat in more detail as it applies particularly to various industries in which the need for lighting betterment is greatest because of the important war work they are engaged in or because of the especially deplorable lighting conditions that now generally prevail. Five of these articles have already appeared in the ELECTRICAL REVIEW, as follows: "Better Lighting of Machine Shops," June 1, 1918; "Better Lighting of Textile Mills," June 29, 1918; "Improved Lighting of Meat-Packing Plants," July 20, 1918; "Improved Lighting of Automobile Manufacturing Plants," August 10, 1918; "The Lighting of Printing and Bookbinding Plants," August 24, 1918. Other articles in this series to appear in early issues will deal with the lighting of woodworking plants, paint and varnish works, pottery and glass works, rubber mills, leather goods factories, iron and steel mills, and electrical products factories.

All this literature issued by the manufacturers of lighting equipment and the numerous articles on the subject should present ample ammunition to anyone that really wants to go after this business so that success in obtaining it depends only on the persistency with which the effort is made.

Some electrical men, especially electrical contractors, have hesitated in taking up this work for fear that they did not know how to lay out a satisfactory lighting installation. It is true that considerable knowledge of illuminating engineering is required to solve difficult problems in lighting design. However, most factory lighting problems are relatively simple and the layout of a good system that will meet requirements can be undertaken by any electrical contractor or lighting salesman with good judgment and ability to lay out simple floor plans. This subject was discussed in an article entitled "How to Plan the Lighting Installation for a Factory," published in the ELECTRICAL REVIEW of July 13, 1918.

Some Important Phases of Industrial Lighting

Conservation of Labor Through Improved Lighting—Proper Lighting Layout Simple Problem—Typical Example Worked Out—Commonly Neglected Features of Factory Lighting

By W. T. BLACKWELL

Commercial Engineering Department, Westinghouse Lamp Company

THE average plant manager thinks of his factory in terms of machines and output capacity, but gives scant consideration to the human factor in his business. He will install in his factory the most modern and efficient machinery obtainable and employ the highest type of skilled labor but there he stops. Yet the employe represents an actual investment, just as real as the buildings and equipment, for he must be trained to perform the work for which he has been employed. The length of training may vary according to the class of work, but in any case the man's salary during his training period represents an actual monetary investment.

The labor problem is becoming more difficult owing to the war, therefore anything that has a bearing on the subject which will tend to increase the efficiency of the employe is in line with the spirit of the times. We are conserving our foodstuffs, coal and other materials, so why not also labor?

In most factories the planning of the lighting is left either to the tender mercies of the electrician, who is supposed to know everything about matters electrical, or to the individual employe, whose ideas of lighting are primitive. Take, for example, a machine shop where there are many lathes. Almost every lathe has an individual or local light, in most cases without a reflector, but with the lamp carefully protected against breakage. Can a man work to the best advantage with a 40-watt lamp glaring a foot away from his eyes?

The condition shown in Fig. 1 is but one of many examples of bad lighting which may be found in almost any plant. If a local light is necessary, it must first be determined how much light is required and then a suitable reflector provided, which performs the dual purpose of reflecting the light where it is needed and of protecting the operative's eyes from glare. Fig. 2 shows what a severe eye strain the operative is subjected to if a bare lamp is used.

It is not unusual to hear a plant superintendent speak with pride of the design of a new building which has fully 80 per cent window area and skylights; yet in six months the windows will be found dirty and the interior of the building in need of a coat of whitewash. Systematic cleaning of windows and whitewashing the walls and ceilings will more than pay for the labor involved by making the use of artificial light less necessary through taking full advantage of the natural lighting; it also pays by making the workrooms more cheerful and tidy places to work in.

Owing to the common indifference on the part of industrial plant managers to the subject of lighting, both natural and artificial, a number of states have adopted minimum standards for artificial lighting. At the present time such codes are in effect in Wisconsin, Pennsylvania and New Jersey, and both Ohio and New York have codes in preparation. These codes roughly classify the work and give minimum and desirable intensities of illumination in foot-candles necessary.

TABLE I.—COMPARISON OF LIGHTING CODE REQUIREMENTS.

Area or Class of Work.	Wisconsin Code		Pennsylvania and New Jersey Codes.	
	Minimum values. Ft.-cdls.*	Upper desirable values. Ft.-cdls.	Minimum values. Ft.-cdls.	Upper desirable values. Ft.-cdls.
Roadways and yard thoroughfares	0.02	0.25	0.05	0.25
Storage spaces	0.25	1.00	0.25	0.50
Stairways, passages and aisles	0.25	2.00	0.25	0.50
Toilets and washrooms	0.50	3.00	....	....
Rough manufacturing, such as foundry work	1.25	4.00	1.25	2.50
Fine manufacturing, such as fine lathe work	3.00	8.00	3.50	6.00
Special cases of fine work, such as watch making	5.00	15.00	5.00	15.00

*An idea of the meaning of a "foot-candle" as a unit of illumination intensity may be gained from the fact that an intensity of one foot-candle is produced on a surface four feet from a lamp which gives off 16 candlepower in the direction of the surface.

The foregoing has been given briefly to show the importance of better factory lighting as a remedy for the deplorably bad conditions that are commonly met with. The fact that the states mentioned have found it necessary to enact factory lighting codes shows that the authorities are being aroused to action that will overcome the constant menace due to poor lighting. With this introduction it may be advisable to consider how easily a plant may have its lighting system installed on modern, efficient and effective lines, and to

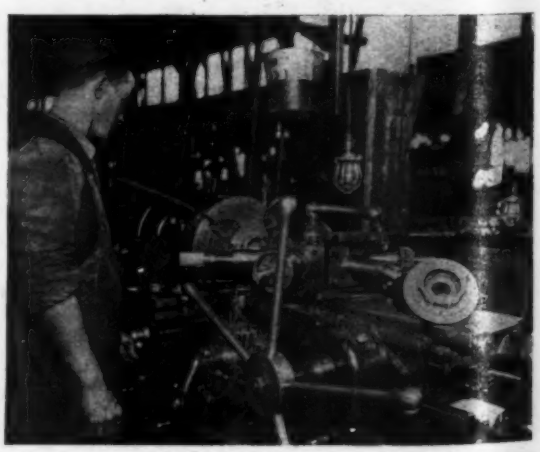


Fig. 1.—A Common Method of Lighting Lathes. The Lamp is Well Protected, But What About the Operator's Eyes?

Fig. 2.—Typical Example of the Severe Eye Strain That Operatives Are Subjected to When Localized Lighting Is Supplied as Shown in Fig. 1.

illustrate with a typical example of good factory lighting layout.

General speaking, the lighting is figured out backwards. Having the dimensions of the space to be lighted, it is then necessary to know the class of work performed, together with the layout of the machinery and benches. This information is drawn up on a plan so that the position of lights may be shown in their correct relation to the machines.

Before proceeding further it would be well to consider the various types of lighting in common usage, i. e., direct, semi-indirect and indirect. A direct lighting unit may be defined as being a fixture which is designed to supply the greater part of the light emitted down to the working plane. The reflectors used with it may be of glass, either mirrored, prismatic or opal, or of metal. In industrial plants it is customary to use porcelain-enameled steel reflectors which are practically unbreakable, easily cleaned and will not deteriorate. There are five typical shapes of reflectors—flat cone, shallow bowl, dome, deep bowl and angle, giving the types of light distribution known as distributing, extensive, intensive and focusing.

Semi-indirect lighting may be described as a system where the units supply a part of the light directly to the working plane and part indirectly by reflection from the ceiling. Obviously the ceiling must be white or light colored for efficient reflection. This method of lighting is not well adapted for lighting many factories, but is widely used for lighting offices, churches, auditoriums, etc. The cost of this form of lighting is also somewhat greater than that with direct lighting.

Indirect lighting consists of reflecting the light from the lamps by means of opaque reflectors to the ceiling, where it is again reflected to the working plane. This method of lighting substantially eliminates glare and gives a diffused light. The principal objections are the higher cost of operation and keeping the lamps and interiors of the reflectors free from dust; it also requires a light-colored ceiling, which must be kept clean. It is used principally in the illumination of offices, auditoriums, schools, motion-picture theaters, etc., and only to a very limited extent in factories.

Design of a Typical Lighting Installation.

Having a general understanding of the types of lighting available and the dimensions of the space to be lighted, the next step is to decide upon the location of the lights. Take, for example, a room 80 by 160 ft., divided into 20-ft. bays, such as the one shown in Fig. 3, which is used for the manufacturing of incandescent lamps. This work comes under the heading of "fine manufacturing" in Table 1. As the building in question is located in New Jersey, it must comply with the factory lighting requirements of that state; therefore, it was decided to use the "upper desirable values" and provide an illumination of 6 foot-candles on the working plane.

To find the amount of light flux necessary to provide this intensity, the following formula is used:

Area of room in square feet $\times$ desired foot-candles $\div$ utilization-factor* = total light in lumens.†

Applying the formula to the room under consideration, which has an area of 80 $\times$ 160 or 12,800 sq. ft., we have:

$$\frac{12{,}800 \text{ sq. ft.} \times 6 \text{ foot-candles}}{0.50} = 163{,}600 \text{ lumens.}$$

As we have found the total light needed for the whole room, it is now necessary to determine the size of lamp to be installed in each bay. Modern practice is to put a single unit in each bay wherever possible

*The utilization-factor is the fraction of the total lumens which are effective on the working plane, or, in other words, the proportion of the total light produced by the lamp which the reflector is capable of reflecting. It depends on the type of reflector used, the shape of the room and the nature of the wall and ceiling surfaces. For porcelain-enameled steel reflectors it may be taken as 0.50.

†The lumen is the amount of light flux emitted in a unit solid angle by a point source of one candlepower. The average spherical candlepower of a lamp multiplied by 12.57 gives its total flux in lumens.

Fig. 3.—Night View in an Incandescent Lamp Factory. Note Uniform Distribution of Light and Absence of Glare.

both for the sake of lower first cost and more efficient operation. There are 32 bays, therefore

$$\frac{153{,}600 \text{ lumens}}{32 \text{ bays}} = 4800 \text{ lumens per bay.}$$

Table 2 shows ratings of the various types and sizes of lamps most commonly used in modern factory lighting. By referring to Table 2 it is seen that the lamp giving the lumens nearest to the quantity desired is the 300-watt Mazda C lamp, clear, having a light flux of 4850 lumens.

TABLE 2.—RATINGS OF MAZDA LAMPS SUITABLE FOR FACTORY LIGHTING.

Watts.	Watts per spherical C-P.	Lumens per watt.	Total lumens.	Base.	Position of burning	Light center length (inches).
110-125-VOLT MAZDA B LAMPS—STRAIGHT SIDE BULBS.						
10	1.67	7.52	75	Med. screw	Any	....
15	1.47	8.55	128	Med. screw	Any	....
25	1.37	9.17	230	Med. screw	Any	....
40	1.33	9.45	378	Med. screw	Any	....
50	1.32	9.52	476	Med. screw	Any	....
60	1.29	9.74	585	Med. screw	Any	....
100	1.24	10.13	1,010	Med. sc. sk.	Any	....
110-125-VOLT MAZDA C LAMPS—PEAR-SHAPE BULBS.						
75	1.09	11.53	865	Med. screw	Any	4 5/16
100	1.00	12.57	1,260	Med. screw	Any	5 3/16
150	0.92	13.66	2,050	Med. screw	Any	5 3/16
200	0.86	14.61	2,920	Med. screw	Tip down	6
300	0.78	16.11	4,850	Mog. screw	Tip down	7
400	0.82	15.32	6,150	Mog. screw	Tip down	7
500	0.78	16.11	8,050	Mog. screw	Tip down	7
750	0.74	16.98	12,800	Mog. screw	Tip down	9½
1,000	0.70	17.95	18,000	Mog. screw	Tip down	9½
110-125 VOLT MAZDA C-2 LAMPS.						
75	1.58	8.0	600	Med. screw	Any	4 5/16
100	1.44	8.7	870	Med. screw	Any	5 3/16
150	1.34	9.4	1,400	Med. screw	Any	5 3/16
200	1.25	10.1	2,000	Med. screw	Tip down	6
300	1.12	11.2	3,350	Mog. screw	Tip down	7
500	1.12	11.2	5,600	Mog. screw	Tip down	7

Mazda C-2 lamps are designed to give light of a quality which will ordinarily make colors appear about as in the light of day.

The shape of reflectors used in the installation which we are describing is the deep-bowl porcelain-enameled steel. All reflectors have what is termed

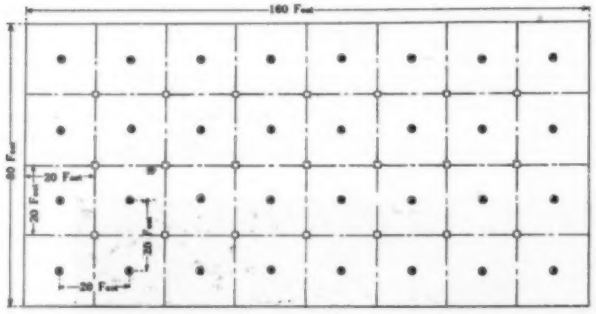


Fig. 4.—Floor Plan of Factory Shown in Fig. 3. Layout of Lighting Units Giving 6 Foot-Candles Illumination at Consumption of 0.75 Watt Per Square Foot.

"spacing ratio"; for example, the spacing ratio for the flat cone would be 2½, the shallow bowl 2, and the deep bowl 1½. This means that in order to provide uniform illumination, the units must not be spaced further apart than the height of the lamp above the working plane, multiplied by the ratio for the type of reflector used.

Fig. 4 shows how the units were spaced with reference to the columns forming the bays. It is essential that the lights be placed equidistant from the columns in order to avoid casting shadows.

In the selection of reflectors it is obvious that the type of reflector to be used is more or less governed by the height of the ceiling, for if the ceiling is low it is necessary either to use a shallow-bowl reflector, in order to distribute the light with a minimum number of units, or to use the deep-bowl reflector with closer spacing, which entails a larger number of units. It is considered good practice, however, to use the deep-bowl reflector in order to shield the eyes from the glare of the exposed light source.

One of the most common mistakes seen around factories is the misuse of reflectors. It should be kept in mind that the five types of reflectors mentioned are made in a number of sizes to accommodate the various sizes of lamps. For every lamp there is a proper reflector. To place a 100-watt lamp in a 200-watt deep-bowl reflector will have the effect of changing the distribution of light from extensive to intensive.

All of the discourse so far has been devoted to general illumination, which is effective for lighting practically all conditions with the exception of places where light is needed beneath or within some obstruction, such as within cylinders being bored. General lighting also does not prove satisfactory when the lights are behind the operator so that a shadow is cast by his body onto the work; however, this is usually due to faulty location of the lighting units. Occasionally it is necessary to provide an independent localized system of lighting for special purposes.

The usual practice consists in installing individual or local lights over the bench or part that requires special lighting. In the case of very particular bench work, these lights should be located about 1 ft. inside of the front line of the bench and spaced about 5 to 6 ft. apart and suspended 5 ft. above the top of the bench. Intensive-type, deep-bowl, porcelain-enameled steel reflectors are well suited for this condition. The size of the lamp required depends entirely upon the nature of work performed. If the locating of such light is left to the judgment of the operator it will be found that each one will have different ideas as to the height, intensity and reflector. Considerable time is lost by the workman adjusting local lights to the changing lighting conditions during the day. This time reaches appreciable proportions so that it is always best to determine the amount of light required and install the fixtures permanently so that the operator cannot disturb them. Still better is it to eliminate localized lighting entirely except in the few places where it is absolutely necessary.

The control or switching arrangement of the lights is also a matter of much importance. It is always best to provide an ample number of switches even though it increases the installation cost, rather than to have a waste of current through insufficient or inconvenient control. The rows of lights parallel to the windows should be placed on one or more circuits, as these lights will not be used as much as those located in the center of the room or furthest from the windows.

In conclusion, the cost of installation and maintenance of lighting equipment depends largely upon the type of wiring and the intensity of light required. It has been estimated that the average cost of operation is only about one-half of 1 per cent of the operators' pay. This is a crude approximation and cannot be used with any degree of certainty because it depends on many conditions. It may be said, however, that proper lighting will increase the production of a plant anywhere from 5 to 25 per cent or more, averaging about 15 per cent. This increase obtainable at such low cost shows that good lighting quickly pays for itself and is one of the best investments that the factory owner can make.

Business Conditions in the Electrical Industry

A Summary of Views Obtained from Leading Manufacturers and Jobbers Regarding Present Conditions in the Industry and the Outlook for the Future

THE same spirit of confidence that is so evident in our fighting forces overseas and in our civilian life over here has permeated our business activities as well and any survey of conditions in the electrical, or any other industry, must be predicated on that basic condition. It is true that the demand for certain commodities is non-existent, that Government regulations have curtailed and in some instances stopped the manufacture and distribution of certain other commodities and that shortage of labor and raw materials has seriously affected practically all manufacturers; but these conditions are now accepted as war necessities and, regardless of personal sacrifices, the industry as a whole is adjusting itself accordingly, firm in the conviction that not only is a military victory assured but with it will come unprecedented business prosperity.

Electrical manufacturers and jobbers, as a unit, pledge their loyal co-operation and support to the Government. As one prominent jobber said, "War activities are, of course, the chief concern of the country and nothing must be permitted to get in the way of American productivities either of war supplies or public necessities." The electrical industry, however, is so closely interwoven with our war activities, both in the supply of industrials and in the home, that it is not strange that business conditions are uniformly good.

In the following paragraphs are presented, in slightly condensed form, the views of a number of prominent manufacturers and jobbers regarding business conditions, present and future. The one outstanding feature in these expressions is the complete realization of the fact that we are in this war to win and that every thought must be centered on this accomplishment. In some few instances individual business is reported to have been adversely affected but in general the reports indicate the electrical industry to be in an unusually sound and prosperous condition with no indications of a material change.

Additional reports which were received too late to be included in this summary will be presented in our next issue.

Opinions of Manufacturers.

L. L. Brastow, Trumbull Electric Manufacturing Company, Plainville, Conn.—The electrical industry is in the process of being classified. Before our industry is classified as an essential industry, it is necessary for all manufacturers to go over their catalogs and eliminate all material that is not absolutely needed. A meeting is now being held in New York on this matter. When this elimination has been made, and when the manufacturers of wiring devices (we are speaking now only of manufacturers of such material as we make, other branches having their special problems) have cut out all non-essentials, then they will appear before the War Trade Bureau, present their case that they may be classified as essential. A pledge, if not already signed, must be signed by all such manufacturers to the effect that all raw material ordered will be used for government purposes directly and indirectly, and a similar pledge must be made by distributors so their stock will be pledged to government purposes. We write this long introduction to impress that all business is for government purposes and the business outlook depends entirely upon how much of a share each manufacturer can get of this government work, directly or indirectly. The survey of business conditions will be very different this year from that of last year, and probably will show that it is mighty good on such lines as the government uses, with such manufacturers as are in touch with government channels, directly or indirectly, and there undoubtedly will be enough demand for material by all manufacturers to make business good.

J. W. Wooley, Oshkosh Manufacturing Company, Oshkosh, Wis.—Frankly we are rather at sea as to what to expect. Did we feel that there was an immediate prospect of the war ending, we could very easily give you our idea of coming business. Just at the present moment practically our entire plant is busy on government specifications, as we are running approximately 95 per cent on government business, and this is about the only business we are accepting. Our business is all organized along the lines laid down by the War Service Board, and for this reason there is no prospect whatever of the writer giving you any survey of commercial business conditions.

C. E. Corrigan, National Metal Molding Company, Pittsburgh, Pa.—All activities in our lines in the electrical industry, both the manufacture and the distribution, are regulated and centered in the all important question of "winning the war," and believe that the electrical industry as a whole is responding in a patriotic manner to the regulations promulgated by the Priorities Division of the War Industries Board. Therefore, all production and distribution of electrical materials must be for war essentials, but notwithstanding these restrictions in our particular line of production, our plant is running to its fullest capacity, hampered, however, by scarcity of labor, which condition is becoming more critical as time advances and which is resulting in the employment of an increasing percentage of female labor. Briefly stated, therefore, the present outlook in our particular line of manufacture indicates plenty of business but strictly within the lines of war essentials, but production limited because of lack of sufficient labor.

A. D. Childs, Cooper Hewitt Electric Company, Hoboken, N. J.—The demand for Cooper Hewitt material has gone up about 25 or 30 per cent over the demand for last year. About 90 per cent of our business is for the Government or for firms doing Government work and as all hands are working overtime nowa-days they must have artificial light. Like every one

else we are having trouble because of labor and materials, but, however, I see no letup in the demands for light.

OPINIONS OF JOBBERS.

W. W. Low, Electric Appliance Company, Chicago.—A year ago we did not realize that we were in war and our first thoughts and energies were entirely centered upon our individual business. Today it is different. Our first and only thought today should be, "What can we do to assist the Government in winning the war and winning it as soon as possible?" This is a mighty big job we have on our hands and beyond the question of a doubt is one that we should bend every energy to, and forget individual propositions. I certainly am at a loss to express an opinion on the immediate future of the business. In the past our first aim has always been to give service to our customers and if we made a promise we usually fulfilled it. Today we are unable to make any promises to our trade. We do not know what we can get or what we can do. We are going to do our best to keep our business and organization intact, but our primary thought all the time will be, "What can we do to bring the war to a successful finish?"

F. M. Bernardin, B-R Electric Company, Kansas City, Mo.—I regret I am unable to report as optimistically on conditions in the Southwest as I did last year. While business in this territory during the first seven months of the current year, in comparison, measures up with the same period of 1917, I am of the opinion from now on we may look for a shrinkage in business, due to the restrictions placed on certain materials by the War Industries Board. War activities are, of course, the chief concern of the country and nothing must be permitted to get in the way of American productivities either of war supplies or public necessities. Ours is not an industrial community, therefore, with the present embargo in effect on non-essentials, we must anticipate a decrease in volume of trade and govern ourselves accordingly.

C. J. Litscher, Grand Rapids, Mich.—In an analysis of our sales, we find that our business has reached a point where we are selling practically no house wiring devices, such as entrance switches, plug cutouts, etc. Our business is now confined practically to industrials requiring conduit, conduit fittings, safety switches, etc. As long as industrials continue to build or make extensions to take care of essential war business, our sales will continue good. Further comment would be a guess at best.

Walter C. Clark, Jas. Clark, Jr., Electric Company, Louisville, Ky.—There is no doubt that the electrical industry from a jobber's standpoint has undergone very material changes in the past year. In the first place, the fact that the Government has taken over the control of the railroads, lines of communication such as telephone and telegraph companies, has a very decided effect. These companies, being under Government control, naturally are following out the lines laid down by the Government as to purchases for replacements and repairs, also for any new extension that might be contemplated or may be necessary. We believe that the large bulk of the jobber's business today is in the nature of distribution to the Government direct or to those agencies who are recognized by the Government as necessary for the general welfare of the country, such as public utilities of various kinds and to those concerns who have war work on hand. The necessity for confining our sales as much as possible to these channels has been set forth very conclusively and concisely in the various bulletins as sent out by the War Industries Board. On the other hand, there has been a decided impetus in the sales of electrical appliances such as vacuum cleaners, electric washing machines, in fact electrical household appliances of all kinds. This has been brought about due to the acute shortage in labor or domestic help, particularly in this section, at the present time.

W. R. Herstein, Electric Supply Company, Memphis, Tenn.—To a large degree, present business conditions in this section, and the outlook for the future, are in a very uncertain state. The fact that this is largely a farming community and that comparatively little industrial activity exists, tends to limit the volume of electrical business at the present time and apparently this tendency will continue. New buildings, extensions of existing circuits and new installations have almost ceased to be under way, and little, if anything, in this line is contemplated for the present. Jobbers in this section who operate sufficiently far from home to take in cantonments, powder and nitrate plants and shipbuilding or other industrial points, are receiving a fair volume of business, but practically none of this comes from the lower Mississippi Valley. Just at this writing I am uncertain regarding the ability of jobbers, contractors and retailers to secure replenishment stocks. It is very embarrassing as priority certificates in this section are practically unknown and a dealer parting with any of his present stock does so with the realization that he will likely be unable to replace it.

A. W. Lindgren, Northern Electric Company, Duluth, Minn.—Business so far in this section has been keeping pace with 1917 volume but there has been somewhat of a decline during August and we look for further decline due to Government restrictions on the distribution of all kinds of supplies. It is up to the electrical jobbers to play their part in the present conflict by conserving their stock to the fullest extent for the use of necessary activities. The character of the electrical jobber's business has changed remarkably in the last twelve months, and taking into consideration the changed business, the curtailment of production, restrictions on distribution, lack of help and other handicaps, the jobber will certainly have his hands full from now on. The electrical jobbers will undoubtedly, however, gladly do whatever they are called upon to do as long as it contributes in the least to the success of the conflict we are at present engaged in.

B. B. Downs, St. Paul Electric Company, St. Paul, Minn.—It is even more difficult to predict business conditions than it was a year ago. As far as the Northwest is concerned, we have nothing to fear if we are able to get the merchandise to sell and let the buying public know that we are going to be able to supply them. Money is naturally plentiful and business is generally good, although total volume for the year will be a trifle under last year's business on account of lack of new building. The great Northwest is prosperous, and, barring the unsettled conditions caused by the war, it would be only a question of getting merchandise for distribution. If we sit tight and play the Government's game we will all come through in a healthy condition.

Frank H. Stewart, Philadelphia, Pa.—Because of the war the volume of the electrical supply business is greater than ever before. With rising prices the volume will continue to increase until the war is ended. The items are and will of course be confined almost entirely to necessities. The net percentage of profit

is much smaller than usual. I cannot forsee the time the war will end, and we will be doing less business than usual.

C. D. Williams, Stuart-Howland Company, Boston, Mass.—Among industrials there has been a noticeable diminution of plant extension and hence buying is done for maintenance chiefly. Exceptions are noted in regard to those who have been awarded new Government contracts, or who are affected indirectly by such awards. Among the shipyards, there are not many whose equipment is not completed, although there is still buying outlook to completion of plant construction to a larger extent than among industrials. In sections where there has been the greatest industrial extension, it is reflected actively among contractors where new building has occurred to take care of increased demands for workmen's housing, but generally speaking such activity is confined to wiring of old houses, repairing and installing equipment in mills. The central stations are still displaying marked conservatism and there is little buying of apparatus except to take care of work either directly or indirectly connected with Government activity. General business conditions are, as we find them, optimistic in spots and depressed elsewhere with a general undercurrent of cheerfulness. There are changing conditions amongst all classes of trade. Thus, the electrical contractors are assuming more the function of retail dealers of popular supplies and sundries. The automobile and garage trade is uncertain as to what commodities they may be able to handle, while the hardware store is including a greater number of articles formerly sold by the electrical shop. Certain materials are going out of the market and others are plentiful in supply with a weak demand and consequent demoralized prices. The latter may include such goods as wiring devices and some forms of conduit fittings, which due to restrictions are scarce and not much in demand. Similarly pipe is limited by the replacement character of orders for essential purposes which the manufacturers are demanding, whereas the market for wire is strong and independent of other conditions. Specialties are selling rapidly, particularly heating devices and washing machines. Considering the manufacturing restrictions, material shortage and the shipping conditions, we find a greater inclination toward normal as to sources and character of business than might be expected. As to the future, we admit our total inability to prophesy, and we limit ourselves, therefore, to saying we can see no indication of any immediate widespread changes in the situation.

LOUISVILLE COMPANY SECURES 6250 HORSEPOWER THIS YEAR.

Important Permanent Power Business, Including Number of Electric Brass-Melting Furnaces.

Since the beginning of the year the Louisville (Ky.) Gas & Electric Company has accepted 145 new contracts calling for 6250 horsepower additional motor business. Nearly 3000 horsepower of this new business is already connected. Practically all of it is permanent and not dependent upon continuance of war orders.

A desirable piece of business has been developed in the large factory of the Standard Manufacturing Company, where the successful trial of an electrically operated brass melting furnace will result in the installation of three oven furnaces, each requiring 80 kilowatts to operate over long-hour periods.

ELECTRICAL PHENOMENA ILLUSTRATED IN NEW MANNER.

Motion-picture films are recommended by Charles F. Bishop, of Rochester, N. Y., for the purpose of illustrating such phenomena as are inherently invisible in character, or otherwise difficult to demonstrate in actual visible form. Where electric circuits are involved, he uses parallel lines for representing each conductor and partly fills in the space between these lines when he wants to picture the flow of current. Likewise, he uses parallel lines of varying density to indicate different degrees of magnetization.

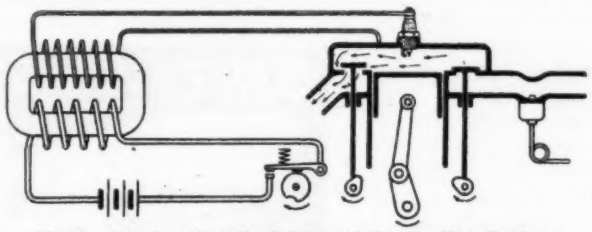


Fig. 1.—Ignition Circuit of Internal Combustion Engine.

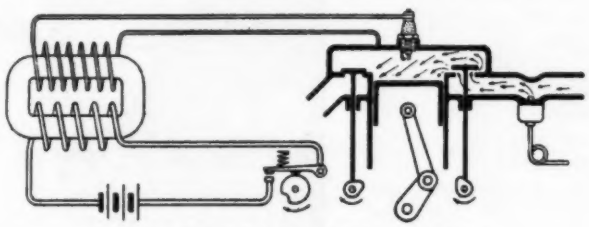


Fig. 2.—Circuit During Intake of Engine.

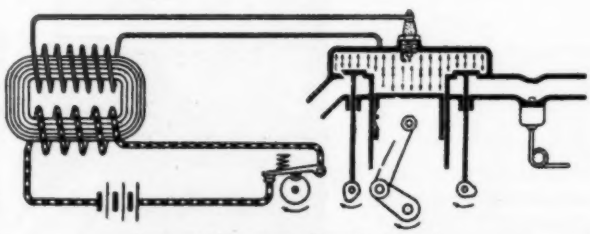


Fig. 3.—Battery Circuit Closed.

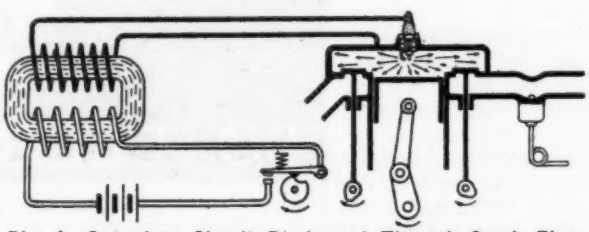


Fig. 4.—Secondary Circuit Discharged Through Spark Plug.

For example, in our illustration (taken from U. S. Patent 1,270,369, which was assigned by Mr. Bishop to the Northeast Electric Company, of Rochester, N. Y.) Fig. 1 shows the ignition circuit of an internal combustion engine as it appears when the engine is exhausting, and Fig. 2 shows the circuit to be equally inoperative during the intake of the engine. Fig. 3 shows the gaseous charge of the engine as compressed and the battery circuit closed through the transformer forming part of the ignition apparatus, thus magnetizing the core of the transformer. Finally, Fig. 4 shows the secondary circuit as discharging at the spark plug, while the magnetization of the transformer core is diminishing. In practice, intermediate views could be shown, so as to illustrate the gradual transition.

Convenient Outlet Campaign Inaugurated in Many Cities

All Branches of Electrical Industry Participating in Educational Movement to Popularize Appliances

A CAMPAIGN, to be a real campaign during these days of concentration and conservation of resources, must be a merchandising movement worthy the name and must have within itself, an intrinsic worth. The outlet campaign inaugurated by the Society for Electrical Development is such a campaign and swinging onto victorious consummation.

About the middle of last July, the monthly *Sales Service* of the Society appeared with a broad announcement of a new electrical campaign, entitled, "Save-By-Wire" the gist of which was featured in the slogan: "SAVE — Food, Fuel, Time, Money — BY WIRE."

Following the announcement of the campaign the interest of the electrical industry was evidenced from all parts of the country by the return cards that poured into the society's headquarters asking for more information. Newspapers wrote in, or telegraphed their willingness to co-operate.

Poster for Outlet Campaign.

Committees began to be formed in cities, towns and even smaller communities all over the country. At the time of going to press, a partial list included such cities and towns lining up for work as: Birmingham and Montgomery, Ala.; Hot Springs, Ark.; Little Rock, Fresno, Los Angeles, Sacramento, San Diego and San Francisco, Cal.; Denver, Col.; Athens, Atlanta, Savannah in Georgia, Boise, Idaho, Bloomington, Moline, Peoria, Rock Island, Springfield, Chicago, Ill.; Indianapolis, Muncie, South Bend, Clinton and Evansville, Ind.; Cedar Rapids, Council Bluffs, Dubuque, Ia.; Wichita, Kan.; Louisville, Ky., and New Orleans, La.; Baltimore, Md.; Haverhill and Worcester, Mass.; Battle Creek, Mich., and other Michigan towns; Joplin, Mo.; St. Louis, Sedalia and Kansas City, Mo.; Billings, Bozeman, Missoula, Mont.; Lincoln, Neb.; Goldfield, Nev.; Charlotte, N. C.; Durham and Raleigh, N. C.; Silver City and Carlsbad, N. M.; Binghamton, Brooklyn, Elmira, Niagara Falls, Poughkeepsie, Utica, N. Y.; Cincinnati, Cleveland, Dayton, Toledo, O.; Enid, El Reno, Muskogee, Oklahoma City, Harrisburg, Hazleton, Philadelphia, Pa.; Providence, R. I.; Chattanooga, Knoxville, Memphis, Tenn.; Nashville, Tenn.; Dallas, Texas; El Paso, Paris, Tex.; Richmond, Va.; Eau Claire, Wis.; Cheyenne, Wyo.

The response of newspapers all over the country was quite remarkable and indicated an eager willingness to co-operate with the society in its novel campaign. Complete information regarding the campaign was sent to them but it is impossible at this writing to forecast absolutely the results, but in all other campaigns inaugurated by the society, newspaper publicity has always been a tremendous factor in prominently advertising the campaigns, and adding to that success.

In a great many homes, even of the better class, when it is desired to use an appliance it is necessary to unscrew a bulb from one of the lighting fixtures, screw in the plug of the drop-cord and then reverse the operation when the appliance is no longer needed. This in almost every instance is an awkward procedure, not only inconvenient in itself, but during the hours when artificial light is used entails any amount of trouble from the interruption of the lighting service.

It can readily be seen that here is a situation common to homes, business houses and manufacturing plants that can be remedied by two methods of procedure: the repair and restoration of appliances already purchased and the installation of the very neces-

sary outlets. While the benefit accrues directly to the contractor, the favorable result will be shared by all branches of the industry, from the central station to the little store.

The underlying idea of the campaign was "Put all your appliances in good condition and install convenient outlets." Throughout the advertising helps furnished by the society, the attention of ultimate consumer was directed to the ease, simplicity and inexpensiveness of these outlets; how the work might be done without disturbing the routine of family life or of business; how the decorations, woodwork and floors are not perceptibly disarranged. The final and great comparison was the small cost of this work compared with increased convenience and utility of the numerous and varied appliances.

The August issue of the *Sales Service* contained full particulars of the work schedule to be followed as far as conditions would permit in various communities. The society's advertising and selling helps included handsome display posters, newspaper advertisements, store and window cards, street-car cards, folders and booklets for direct-by-mail advertising.

The poster, conceded by all to be most beautiful and attractive, won second and popular prizes in the famous poster contest held by the society during a previous trade campaign. The poster is the original work of Vincent Aderente, a superb poster artist, whose work has won many prizes and honorable mention.

Counter cards, store and window cards were furnished, also a new tag printed on red cardboard and illustrated was supplied for tagging each article in stores. Estimate sheets, charts, a special film, lantern slides, folder-booklets were available.

This campaign does not call for any great amount of material but it does help the contractor at a time when he needs the work, and it will put on the central-station circuits the off-peak load for which the majority of them are still working.

POWER PROJECT INVESTIGATED BY FEDERAL RESERVE BOARD.

E. P. Taylor, an engineer representing the capital issues subcommittee of the Federal Reserve Board, San Francisco, is in the Northwest to make an examination of the Skagit River power site which the city of Seattle seeks to develop, with a view to ascertaining whether or not the issue of $5,500,000 in bonds for development purposes will compete with the Government in men, material and money. In connection with this matter, the committee which went to San Francisco to present the claims of the city for development contemplates going to Washington in the near future to lay the matter directly before the Federal Reserve Board. This committee is made up of the mayor, corporation counsel and two members of the city council. Time of the committee's departure will depend somewhat upon how long it takes the engineer of the capital issues subcommittee to finish his investigations and make his findings.

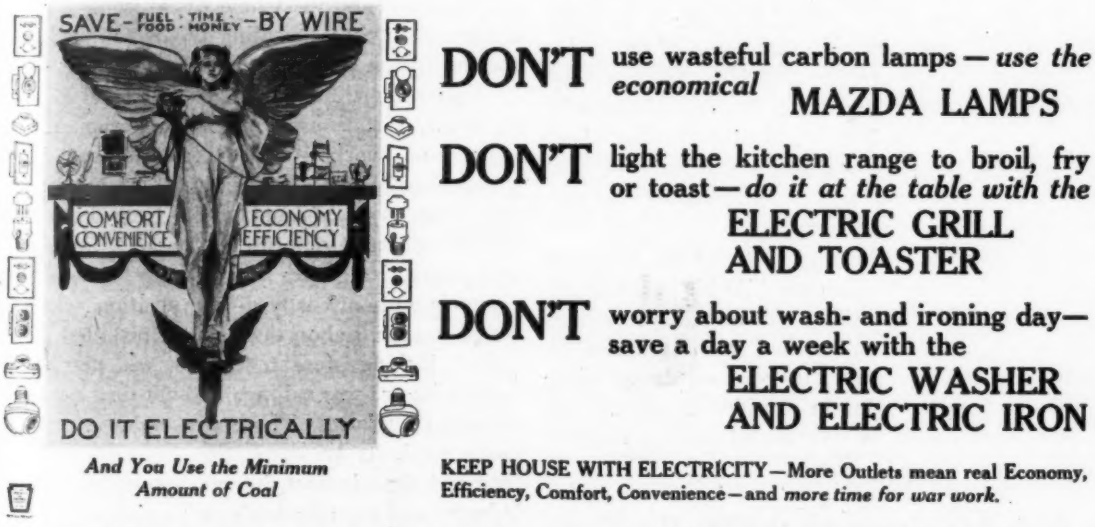
LOUISVILLE COMPANY TO SERVE NEW CANTONMMENT.

Central-Station Service Proves Convenient for Cantonment Supply.

The Louisville Gas & Electric Company will serve all the electric light and power requirements of the new field artillery camp at Stithton. Extension of the company's transmission lines for this purpose will be started soon, the cost of which will be borne by the Government. Fifteen thousand men will be employed in the construction of buildings at the Stithton camp. It is not known yet what the electrical demand will be, but the magnitude of the undertaking may be judged from the fact that the camp will have a capacity for housing 50,000 men.

The Louisville Company is now serving the electrical requirements of Camp Taylor where 30,000 men are encamped. The electrical demand of Camp Taylor amounts to 1000 electrical horsepower.

The commercial department of the Louisville Gas & Electric Company during the week ended August 24 secured 48 new electric light and power customers with 31 kilowatts of lighting and 93 horsepower in motors. New business connected to the company's lines shows an increase of 18 customers with 19 kilowatts of lighting and 74 horsepower in motors. Electric energy output was 23.9 per cent greater than for the corresponding period last year.


SAVE-FUEL FOOD TIME MONEY-BY WIRE
COMFORT CONVENIENCE
ECONOMY EFFICIENCY
DO IT ELECTRICALLY
And You Use the Minimum Amount of Coal
DON'T use wasteful carbon lamps — use the economical MAZDA LAMPS
DON'T light the kitchen range to broil, fry or toast — do it at the table with the ELECTRIC GRILL AND TOASTER
DON'T worry about wash- and ironing day— save a day a week with the ELECTRIC WASHER AND ELECTRIC IRON
KEEP HOUSE WITH ELECTRICITY—More Outlets mean real Economy, Efficiency, Comfort, Convenience—and more time for war work.

Street-Car Card Prepared by Society for Electrical Development for Use in September Outlet Campaign.

Editorial Comment

Soldiers All

THE man power bill makes available about 13,000,000 men who were not touched by the earlier draft. Only a fraction of these men will be called for military service, of course, but the man power bill assures ample reserves for a war of almost indefinite duration and of any magnitude.

Raising the age limit sounds a fairly general and impersonal proposition. But it will affect a good many that read these pages. Some of them will "go" where up to now they have "given"; others will take up undertakings dictated by necessity rather than inclination. Meanwhile some of the younger men, who have been wounded, maimed and with health broken are drifting back to our shores from "over there," to win their way or be found a place again in civil life.

After all, it is the younger men who really deserve most of the community. And if the war is of such duration and the attrition such that some of the older ones of us have to take to forming fours, go grousing in trenches and take a leap "over the top"—which it will not be—we will do it as we best know how. During the interim, those of us that are left must be efficient in our work, and our work must be for the efficient prosecution of the war.

Whatever comes, we are in the war till we have won it. And that means each must do his best toward the same end. For some there will be the spectacular and the glory. For some routine, without praise or recognition. And for some, to keep on doing what they are doing now. But in sacrifice of money, of food, of entertainment, of self, we all become soldiers in a noble cause. On to victory.

The Hand Writing on the Wall

PREPAREDNESS was never needed more greatly than today. Are we prepared, not in the sense implied as of a couple of years ago, but as referring to the future? Are we students of the signs of the times? Are we prepared for what is transpiring? Have we seen the handwriting on the wall and do we comprehend its significance?

Government operation of the railroads; supervision of the telegraph and telephone; strangulation of non-essential industries by control of the raw-materials supply, the enforcement of priority orders, and so forth; Federal supervision of power plants, as yet in the embryo stage, but coming as surely as it is slow, a worthy measure on the score of conserving fuel, abating the smoke nuisance, and of safety to the community. Labor is sitting at the council tables of the nation because it is Labor's war as well as that of the nation as a whole. Women have entered many unthought-of spheres of effort with eminent success, whilst others apparently more fitting have been closed to them by state commission ruling. The power of unionism; the recognition of the responsibility of everyone to the state; the draft of labor and wealth, taxation of profits; subservience of individual to national needs; compulsory military training; the rebirth of the United States as a naval and maritime power; the strangulation hold surely and rapidly tightening upon the existence and world trade of the world's enemies; the birth of thrift in a proverbially extravagant people; the appreciation of national responsibility that has progressed more toward giving a homogeneous product out of the world's melting pot during the last two years than during many previous years. These are some of the things that are going on before us today, happenings pregnant with possibilities for the future of the nation and the whole world, cementing together a powerful people, welding bonds with other nations for the fusion of a united world.

Presently will come the demobilized army, active, gloriously victorious; presently a nation of enormous momentum, working efficiently under vast strain with super-effort will have its industries brought to a sudden, perhaps unexpected, halt. New openings for its efforts will have to be found; its activities, momentum and productive genius will have to be turned to other channels without costly disorganization, while half the world starves. Labor, once called unskilled, now quasi-skilled, lacking present demand, will not willingly go back to its pre-war callings and old-time mode of living without complaint. Those who today control the Nation's food, its transportation, its undertakings upon land and sea—in fact, its very prosecution of war, of industry and even domestic and social affairs, dictators of a nation's actions—will they willingly relinquish the power they now wield?

History is, indeed, in the making. But more than this. Economic, social, industrial, international and world affairs are moving fast, changing radically, a virtual upheaval. Three years ago the Monroe Doctrine was claimed to keep us out of war, and keep us immune from, interference by or prevent our interference with European powers. We were told that to fight in Europe would be antagonistic to the spirit of Monroe's famous message to Congress of 1823. But we now know that fighting in Europe was the only way to keep within our power and ability to live up to the Monroe Doctrine in either spirit or fact.

It does not suffice for us to go on in the present. What of the future, of which so many vital and powerful influences are today at work, some spectacular, some insidious, some invisible but none the less real; all of intense significance? Preparedness means prep-

aration for the future. And preparedness is possible only where there is understanding.

Are you prepared for the morrow? Have you seen the handwriting on the wall? Have you interpreted it, and understood what it portends? These are the questions, the vital questions of the hour and of the future, that every captain of industry, every employer of labor, every worker and employe, in fact each one of us, must ask himself. Those of us who are not prepared are neither true to ourselves nor to our country. It is not enough to rest secure of our knowledge of today. We must be students of the signs of the times, if we would serve our country best, and ourselves survive.

Lighting Opportunities and Responsibilities

GRADUAL return of the shorter days should once more direct attention to the subject of lighting. This is the season when the public usually gives an attentive ear to arguments for more and better light. It is also the season of golden opportunities for the lighting man. Normally, yes, but apparently not this year. Keenly feeling the sting received by their business through daylight saving and lightless nights, lighting men may inwardly bewail the pessimistic outlook. The public also, due to excessive emphasis on lighting curtailment, may be very reluctant to concede the need for lighting betterment in any particular. Indeed, the prospects do seem both literally and figuratively very gloomy.

But the war is playing havoc with many other business interests. Is this any reason for laying down and bemoaning the situation? Anyone who realizes the significance of this heroic struggle of the world to throw off the menace of ruthless conquest by militaristic autocracy must recognize that this struggle must be fought to a finish despite interference with business. In fact, it is *the* primary business of the world until the conflict is won. The first duty of all business men is to see what they can do to aid in making victory more sure and speedy. If they can adapt their private business to this national need, so much the better for their business as well as the nation.

In view of these truths it behooves the lighting interests that have a tendency to be pessimistic, because the outlook in several lines of lighting activity is not promising, to investigate and find out what can be done by lighting to help win the war. Certainly if there is anything in their line that can be contributed to this end it should offer not only a favorable opportunity to be of service but constitute a patriotic duty to render the service.

In surveying the field it does not take long to discover several opportunities in this line that are either highly essential to prosecution of the war or very nearly so. In the first group are lighting for strictly military purposes and improved lighting for industries engaged in the production of essential war supplies. Closely akin to this essential lighting is a second group, including any development that improves efficiency and reduces waste, whether of labor, fuel, food, metals or other materials directly or indirectly needed for effective conduct of the war.

Of the first group of essential lighting opportunities, the needs in military lighting of cantonments, navy yards, etc., are being well taken care of. Very much broader opportunities for the lighting industry as a whole exist in the highly necessary betterment of industrial lighting so as to increase production, conserve labor, diminish accidents and waste. For this purpose it may be well to adopt the slogan so timely suggested by some lighting men, "Light up means speed up." The more speed we can put into our industries the more speedily we shall see the return of peace.

The splendid opportunities confronting the lighting industry in this connection and its obligation to thus serve the nation are pointed out in an article by Mr. Bernhard appearing in this issue. Although betterment of industrial lighting has been agitated for several years, the prospects of this agitation bearing fruit were never so good as now. Those lighting interests in industrial communities that are still lukewarm on the subject are not only missing valuable opportunities, but are dangerously near being cataloged in the slacker class. The ELECTRICAL REVIEW is trying to do its bit by arousing these interests to the importance of the subject and by a series of articles furnishing arguments and suggestions for improved lighting in leading industries.

There is in the second group of lighting opportunities an excellent field for lighting men to increase their war-service activities, especially in places where industrial plants are few or entirely absent. A strong movement for elimination of inefficient lighting is now under way. It calls especially for removal of the obsolete carbon-filament lamps. It can very appropriately be extended to provide suitable reflectors for bare lamps and replacement of inefficient fixtures and lighting systems. Even in a purely residence town much can be done in this line, but in doing it let us remember that in but very few places have we had too much light, consequently a considerable part of the improved efficiency of modern equipment should be utilized for obtaining better light. But in factory towns it must be remembered that improvement of factory lighting should be given precedence as the more essential to the war.

In conclusion, it may be repeated that the betterment of industrial lighting which has long been needed was never so urgently necessary as during this gigantic conflict for making the world safe for democracy. Lighting interests have a patriotic obligation in bringing the matter to the front and keeping it a live subject as long as there remains a factory in the country with gloomy workrooms whose meager lighting is a constant menace to the eyesight and general safety of the workers and a continual source of inefficiency and waste.

Week's Events

Jobbers on Preferential List—Smoke Inspectors Meet—Gem Lamps to Be Eliminated and Carbon Lamps Curtailed

ELECTRICAL JOBBERS PLACED ON PREFERENTIAL LIST.

War Industries Board Believes Business Should Be Confined to Essentials.

The War Industries Board authorizes the following:

At a hearing before the Priorities Commissioner and other representatives of the War Industries Board, the War Service Committee, representing electrical jobbers, presented their claims for preferred treatment to maintain their stocks for general distribution.

As a result of the hearing, the Priorities Commissioner announced that manufacturers of electrical apparatus and supplies will be accorded a degree of preference for their materials to enable them to operate, conditioned upon their pledging themselves to limit their output to essential products and undertake to see that such products are devoted solely to essential uses as that term may be defined from time to time by the Priorities Division. The manufacturers must be relied upon to police their own industry and also in a measure to police jobbers, distributors and retail dealers.

It is believed to be in the public interest that jobbers should be permitted to maintain reasonable stocks from which Government agencies, war industries and the civilian population may draw for their necessary essential requirements, provided the jobbers will pledge themselves to rigidly restrict the use of all stocks to solely essential uses and to reduce to an absolute minimum both jobbing and retail stocks. The jobbers will be relied upon to police their own industry and that of the retailers. Any jobber or retailer violating the pledge will be cut off from procuring further supplies.

FUEL CONSERVATION DISCUSSED BY SMOKE INSPECTORS.

Annual Convention of the Smoke Prevention Association Considers Important Topics.

The thirteenth annual convention of the Smoke Prevention Association, at Newark, N. J., August 20-22, was one of the most successful meetings ever held by the organization. Several interesting and important papers relating to fuel conservation and smoke prevention were presented, while the various entertainment features as arranged by Daniel J. Maloney, Newark, city smoke inspector and first vice-president of the association, were thoroughly enjoyed by the delegates and guests.

The initial session on Tuesday morning was called to order by William A. Pittsford, Kewanee, Ill., in the absence of President William H. Reid, of Chicago. This meeting was devoted to preparatory work in connection with the convention, including a reading of the minutes of the twelfth annual convention held a year ago at Columbus, Ohio, by Secretary Frank A. Chambers, Chicago, and a few appropriate remarks by Mr. Maloney regarding the program and amusement plans. In closing the brief session, Mr. Pittsford spoke in high terms of a book to be issued by the Smoke Department of the City of Newark, compiled by Mr. Maloney, giving valuable data and information on the subject of boiler installations and kindred apparatus, to assist in smoke elimination and coal conservation. This book, a volume of 78 pages, has been designed for general distribution, with purpose to assist the power-plant operative, power-plant owner, engineers and others. Completed copies of the booklet were given to the delegates before the close of the convention.

At the Tuesday afternoon session, Mayor Gillen, of Newark, extended a word of welcome to the visitors on behalf of the city, making reference to features of interest in the municipality which they should see before leaving. The initial address was tendered by Newell W. Roberts, vice-president of the International Coal Products Corporation, New York, on the subject of "Carbocoal." This is a new fuel now being manufactured at Irvington, a section of Newark. This fuel, produced in briquet form from high volatile bituminous coal, is smokeless and, as developed, has all the essential properties of a perfect coal. The success attending its use has attracted the Government, with the result that a large plant for the manufacture of carbocoal for navy and merchant-vessel service is now being erected at Clinchfield, Va. This plant will cost about $2,000,000 and is expected to be ready for operation in the early part of the coming year.

Frank W. Casler, superintendent of production, the Public Service Corporation, Newark, gave an interesting talk, termed, "Burning a Million Tons of Coal a Year and How We Supervise It," an abstract of which appears elsewhere in this issue.

Papers were also presented at this session by A. H. Blackburn, chief engineer, Underfeed Stoker Company of America, Chicago, "Boiler Room Efficiency," and read in his absence by A. B. Curtis, Jr., of the same company; and "Smokeless Combustion with Chain-Grate Stokers," a closely kindred subject, by Thomas A. Marsh, chief engineer, the Green Engineering Company, East Chicago, Ind. A comprehensive discussion of this last paper followed its reading, joined in by J. G. Worker, of the Westinghouse Electric & Manufacturing Company, Pittsburgh; O. C. Woolson, boiler expert, Newark, N. J., William A. Pittsford and others.

In the evening a special motion-picture exhibit was given for the delegates and guests at Proctor's Palace Theater Roof Garden, at which was shown, among other films, a picture produced by the Westinghouse Electric & Manufacturing Company, showing the value of the electrification of railroad lines, and a film of the Kewanee Boiler Company, Kewanee, Ill., illustrating the features of boiler installations to make for smoke abatement.

The only business session on Wednesday was held in the forenoon, and devoted to an illustrated address

by William A. Pittsford, Kewanee Boiler Company, on the subject of "Using Bituminous Coal for Boilers for Heating," covering, primarily, low-pressure boiler installations and proper character of settings to develop right combustion and smoke prevention.

Wednesday afternoon was given over to an automobile trip to the Newark watersheds at Pequannock and vicinity, a total distance of about 80 miles. At one of the stopping points, an informal address was made by Frank J. Foley, Deputy Commissioner of Parks and Public Property.

Thursday, the last day of the convention, was designated as "Railroad Day," and devoted to papers and addresses of particuar interest to those engaged in locomotive operation. Thomas F. F. Lee, Woodhaven, L. I., gave an interesting talk on combustion, dealing for the most part with personal experiences and experiments and leading to the development of a new type of stoker, patents for which are about to be issued.

The different papers and addresses presented were: "Burning Pulverized Coal," by H. D. Savage, vice-president of the Locomotive Pulverzied Fuel Company, New York, covering both locomotives and stationary power plants; "Mechanical Stoking of Locomotives," by W. S. Bartholomew, of the Locomotive Stoker Company, Pittsburgh; a talk by Robert Collett, New York, Conservation Department of the United States Fuel Administration, dealing with the importance of fuel conservation; and brief talks by C. D. Van Schaick, combustion expert, New York Central Lines, New York; J. H. Lewis, chief smoke inspector, Chicago, Burlington & Quincy Railroad, Chicago; and John B. Hurley, Wabash Railroad, Decatur, Ill.

At the conclusion of the session the annual election of officers was held, resulting in the appointment of the following for the ensuing year: President, Warren A. Edson, Boston; first vice-president, W. H. Corbett, Michigan City, Ind.; second vice-president, William A. Pittsford, Kewanee, Ill.; and secretary-treasurer, Frank A. Chambers, Chicago, re-elected. Chicago was selected as the next convention city, with exact time of meeting to be decided at a later date; a resolution was adopted providing for the arrangement for an exhibit hall at the next annual meeting for the use of manufacturers of power-plant apparatus.

INEFFICIENT ELECTRIC LAMPS TO BE ELIMINATED.

Important Program Outlined by United States Fuel Administration for Standardizing Lamp and Saving Fuel for Lighting.

A plan to save electricity and thereby to save fuel by the elimination of inefficient incandescent lamps has been adopted by the United States Fuel Administration, to become effective September 15, 1918.

The plan contemplates the gradual elimination, except in rare instances, of the inefficient types of incandescent lamps and their substitution by the more efficient tungsten lamps. The fully developed plan of the Administration is shown in the report of the proceedings of the Committee of Incandescent Lamp Manufacturers, which is given in full.

The personnel of the committee, appointed at the meeting of manufacturers, held in Washington, July 15, is as follows:

Temporary chairman: J. W. Lieb.

Representing exclusive carbon filament lamp manufacturers: H. A. Baum, general manager, Safety Electric Company, Chicago; J. B. Estabrook, Sunlight Electrical Manufacturing Company, Warren, Ohio; B. G. Erskine, president, Novelty Incandescent Lamp Company, Emporium, Pa.; W. H. Dyer, sales manager, North American Electric Lamp Company, St. Louis.

Representing license interests: T. C. Dowling, Westinghouse Lamp Company, New York; J. Camp, Franklin Electric Manufacturing Company, Hartford, Conn.; H. B. Rogers and G. C. Osborn, General Electric Company.

Representing central stations: John W. Lieb, chairman, National Committee on Gas and Electric Service; William Ferguson, Hartford Electric Light & Power Company.

Representing exclusive tungsten manufacturers: Dr. A. J. Liebmann, Independent Lamp & Wire Company, New York.

Representing manufacturers of both carbon and tungsten lamps: F. W. Marsh, president, Consolidated Electric Lamp Company, Danvers, Mass.

Representing the Government: Dr. J. F. Meyer, physicist, Bureau of Standards, Washington; Theo. L. Gatchel, chief electrical draftsman, Navy Department, Washington.

The plan submitted by the Committee at the request of the Fuel Administration under date of July 29 is as follows:

CONSERVATION PROGRAM.

The following program is recommended to the United States Fuel Administration:

1. The elimination of unnecessary types of standard carbon lamps and of carbon lamp types for special application as follows:

The standard 60-watt multiple carbon lamp 100-130 volt range.

The standard 20-watt S-14 bulb multiple carbon lamp 100-130 volt range.

The 120-watt standard multiple carbon lamp 100-130 volt range.

The complete elimination of standard 30-watt and 60-watt round-bulb multiple-carbon lamps, and all other types of 100-130 volt range multiple-carbon lamps with standard base used for decorative purposes.

2. The complete abandonment by central-station companies of the installation and renewal of carbon incandescent lamps of all sizes and discouragement of their use by their consumers and the public for any use or application for which tungsten lamps can be substituted; this policy to go into full effect not later than September 15, 1918.

3. The gradual abandonment of the installation and renewal of metallized filament (GEM) lamps of all sizes by central-station companies and discouragement of their use by their consumers and the public for any use or application for which tungsten lamps can be substituted.

Under special and unusual conditions where it is absolutely necessary to use lamps with exceptionally robust filaments owing to rough handling or excessive vibration, the use of carbon lamps is recommended so that the metallized filament (GEM) type may be completely eliminated. This policy to go into full effect not later than November 15, 1918.

4. It is recommended that the use of considerable numbers of the smaller sizes of lamps for commercial and industrial applications be eliminated where it is practicable to substitute for them large single gas-filled lamps of highest efficiency in a smaller number of lighting units.

5. It is recommended that the use of vacuum tungsten lamps in sizes of 100 watts and over be eliminated and whenever practicable gas-filled tungsten lamps of highest efficiency substituted therefor.

6. It is recommended that electric light and power companies employ no differentials in their price schedules for the sale or renewal of lamps which may tend to encourage the use of larger sizes of lamps rather than smaller sizes, except as such differentials are justified by differences in the cost of the service.

7. It is recommended that all manufacturers of carbon and metallized filament (GEM) lamps insert with each standard package of such lamps shipped by them a printed notice directing the attention of the user of the lamps to the fact

that the particular lamps in the package should be used only in locations where it would be impracticable, because of excessive vibration and rough handling or for therapeutic and heating purposes, to use satisfactorily a more efficient type of lamp.

It is recommended that the manufacturers use the following standard form for such notice:

> Complying with the request of the U. S. Fuel Administration, you are asked not to use, or advise the use of, the lamps in this package in such locations and under such service conditions where a more efficient type of lamp would be satisfactory.
>
> (Signed) .....
> Manufacturer's Name.

8. It is recommended that when the United States Fuel Administration promulgates these regulations it should call the attention thereto of the Public Service Commissions and other regulatory bodies, state and municipal, and should urge that where a public-service corporation in order to comply with the terms thereof has the cost of lamp renewal service under the contracts with its customers substantially increased thereby, the public-service corporation be permitted either to collect from its customers so affected the increase in the cost of the lamp renewal service or discontinue the furnishing of free lamp-renewal service; and, where practicable under present conditions, make therefor an appropriate adjustment.

9. It is recommended that the central-station companies be requested to urge upon their customers and the general public in the advertising in the daily press, company house organs and in all promotion literature, the importance of selecting lamps of sizes which do not provide an amount of illumination beyond what is strictly necessary, the exercise of due care in extinguishing all lamps which are not needed, and the elimination of all extravagant and wasteful use of light, as a measure of fuel conservation.

10. It is recommended that a pronouncement be prepared and submitted for the approval of the United States Fuel Administration to be distributed to all of the electric light and power companies of the United States, through the facilities offered by the National Committee on Gas and Electric Service, calling attention to the urgent necessity of fuel conservation and inviting the co-operation of all users of electricity, for light and power purposes, to a full compliance with the conservation program as finally approved by the Fuel Administration.

It is recommended that in the promulgation of the program by the United States Fuel Administration the co-operation of the manufacturers, electrical supply dealers and electrical jobbers be invited in order to secure the widest possible publicity for the conservation measures proposed, reaching in these several ways every class of lamp user through all of the production and distribution channels.

11. It is recommended that the United States Fuel Administration communicate the program as finally adopted to the various government departments, making extensive use of incandescent electric lamps, such as the Shipping Board, Army, Navy, Treasury Department, etc., and invite their co-operation in conforming with the program to the largest practicable extent.

General Statement Regarding Foregoing Program.

Many electric light and power companies throughout the country furnish incandescent electric lamps of the metallized filament (GEM) type, and to a very much less extent of the carbon type, as free renewals within the cost of current or at a small extra charge either for the first installation of the lamps, or for subsequent renewals. The conditions of rendering this service are set forth in the rate schedules of the companies as filed with the public service commissions or other regulatory bodies, state or municipal, and they are often incorporated in the franchise provisions, or in the street lighting contracts between the utility companies and the municipalities.

A change in the lamps furnished under these contracts from carbon or GEM lamps to tungsten lamps, or from large-sized-vacuum tungsten lamps to gas-filled tungsten lamps, in order to comply with the program above outlined will often result in an increase in the cost of the service. It is impossible for the electric light and power companies to bear this increased burden of cost of service at this time when nearly every public utility throughout the nation is suffering seriously due to impaired revenues or increased cost of service or both, due to war conditions.

It is, therefore, but fair to the utilities, where the substitution of lamps of higher efficiency for those of lower efficiency results in an increased cost of lamp service to their customers in order to comply with the recommendations of the program, that the public service corporations should be allowed to recoup themselves for the actual increased cost of service under the new conditions, and the United States Fuel Administration should issue a definite recommendation to this effect.

Should it be deemed inexpedient to make an extra charge to the customer to effect the change if the existing contract provides for the furnishing of lamps of the types eliminated under the program, the public utility corporation should be allowed to discontinue the supply of free lamp-renewal service and, where practicable under the conditions in which the companies find themselves, an appropriate adjustment should be made therefor.

It is considered impracticable to make a broad recommendation in regard to the elimination or restriction in the use of 40, 50 or 60-watt tungsten lamps, and the substitution therefor of 10, 15 or 25-watt tungsten lamps. The conditions surrounding the use of these lamps, the locations where installed, the type of fixture and glassware used, and the necessity for adequate illumination either for industrial processes to secure maximum production, or in the home to avoid the glare from naked lamps or the eye strain that would result from insufficient illumination, make it difficult to recommend the general substitution of lamps of the smaller sizes for the larger sized lamps.

It is possible to obtain the results desired by the Fuel Administration in the form of a saving of fuel in a considerable measure by emphasizing to the consumers of electric light and power and to the public generally, the importance of saving electrical energy and hence fuel, the desirability of eliminating every extravagant or wasteful use of light, and by discouraging the use of a larger lamp than is necessary for the immediate purpose for which the lamp is to be used.

The existing policy of the central stations whereby they recommend to their customers and in various ways encourage the use of standard lamps of medium size, is based upon a broad consideration of all the economies controlling the furnishing to the public of satisfactory lighting service at the lowest total cost. Any temporary departure from that policy toward the encouragement of the use of smaller lamps must therefore be recognized as a step taken to meet an existing national emergency and justifiable for this reason.

The purpose of the program would, in a measure, be defeated and an objectionable condition created if the substitution of types would result, for instance, in the use of two 25-watt lamps where formerly a single 40, 50 or 60-watt lamp was used. In considering a more general use of 10 and 15-watt tungsten lamps, the increased use of the raw materials required for their manufacture, such as bulbs, brass bases, etc., must be considered, as it would be extremely difficult to obtain them in the increased quantities necessary under present conditions. The difficulty attendant upon making an increased number of low-wattage lamps with the necessary losses in manufacture, estimated at from 20 to 25 per cent in excess of the higher

wattage type, would introduce a serious dislocation of present manufacturing facilities.

It would also be pointed out that tungsten lamps of the smaller sizes have filaments which are less robust than those in the larger sizes, their life is consequently shorter and an increased number would be required for renewals, thus overtaxing already overstrained production facilities.

Attention is also called to the fact that the efficiency of the smaller sizes of tungsten lamps is considerably less than the efficiency of the larger types.

Consideration must also be given to the importance of providing adequate illumination in manufacturing and industrial plants engaged on war industries, so as to secure the maximum production now demanded of them. It is the universal experience that a relatively small increase in illumination, affecting the fuel consumed to a very slight extent, results in a comparatively large improvement in both the quality and quantity of the output. It is, therefore, necessary to proceed with caution in advising any restriction of illumination in industrial plants engaged on war industries. On the other hand, there are many locations and conditions, particularly in the household, where the larger sizes of lamps are now being used and where smaller lamps would no doubt give adequate illumination, the substitution affording a large reduction in the total consumption of current through which a large aggregate saving of fuel would be effected.

Where a utility company as a part of its lamp-renewal policy supplies tungsten lamps of both large and small sizes, it is recommended that the difference in the renewal or sale prices between the large and small sizes be based on the actual difference in the cost to the company of the service in each case and that no attempt be made to influence the use of the larger sizes of lamps by the consumers or the public through the establishment of a price differential that is not justified by the respective service costs.

By the abandonment of the types as proposed in Article 1, such carbon lamps as it might still be necessary to use under the special conditions outlined would be the next smaller sizes.

It is desirable to secure the complete elimination of the metallized filament (GEM) type of lamps even though the substitution for them of carbon filament lamps in the few exceptional cases where it becomes absolutely necessary to use particularly rugged filaments may result in an apparently increased energy consumption. This increase in a few isolated cases should not defeat the important advantages to be attained by the complete elimination of the metallized filament lamps, and an intermediate type between the carbon and tungsten lamps now become unnecessary.

In order to secure the most complete elimination possible of the inefficient carbon and GEM lamps of all sizes it is recommended that where consumers specifically request lamps of these types from central stations or lamp dealers, their attention be called in each case to the recommendations of the Fuel Administration as outlined in the program and every effort be made to discourage the use of inefficient lamps by the public.

Many of these problems would be solved and a complete and almost universal substitute for carbon and GEM lamps be provided if a tungsten filament were available very much more robust than the present product. It is understood that manufacturers are now very actively at work on this problem and the outlook for its solution seems very hopeful. The manufacturers should be urged to still greater efforts in order to accomplish this very important result at the earliest possible moment.

Attention is also called at this time to the importance of the proper rating and labeling of lamps by the manufacturers so that the consumption of energy does not exceed the limits provided for in the Government specifications.

The change in production of lamps from the manufacturing standpoint necessary to meet the program above outlined does not prevent insuperable difficulties, but will inevitably result in some interference with the business of certain manufacturers producing, wholly or in part, lamps of the types it is proposed to eliminate or the use of which is to be discouraged. It is believed that an agreement may be had with the larger manufacturers whose principal business is the production of tungsten lamps that they may abandon their output of carbon lamps, and transfer of the production of carbon lamps may possibly be arranged under a mutual agreement made through the administrative authorities at Washington between the larger manufacturing companies and the smaller businesses now producing carbon lamps. This phase of the question presents some legal as well as industrial aspects which can no doubt be satisfactorily adjusted at a conference in Washington between the administrative authorities and the representatives of the parties in interest.

All those present at the meeting pledged themselves to devote their best efforts to making the program effective and in securing for the Fuel Administration the largest possible measure of co-operation to this end from the various organizations which they represented.

MEETING OF NORTHWESTERN ASSOCIATION WILL BE DEVOTED TO WAR TOPICS.

The Northwestern Light and Power Association, instead of holding a general three-days' convention as originally intended, will hold a one-day session, to be attended by Class A members, at Multnomah Hotel, Portland, Ore., on September 13. While the association of 300 regular members has about 50 Class A members, it is estimated that there will be about 30 in attendance, of representatives of power and light companies. This action was thought advisable on account of war conditions that have materially cut down the number of men in the various departments of the public utility companies.

The work of the session will comprise the hearing of committee reports, the reading of special papers and the discussion of matters of vital interest to the operating companies, with special reference to the production of greater revenues.

ILLUMINATING ENGINEERS TO DISCUSS WAR-TIME LIGHTING.

The Illuminating Engineering Society will hold its annual convention at the Engineering Societies Building, 29 West 39th street, New York City, October 10, 1918.

War-time lighting economies, the use of better lighting in speeding up war production and manufactures, the lighting of camps, effect of lighting curtailment on crime, and automobile headlight legislation will be among the subjects to be discussed by lighting authorities of national reputation.

Commercial

Important Contract for Public Service Company—Chicago Company Employs Women Readers—Other Utility Notes

PUBLIC SERVICE COMPANY SECURES 3000-HORSEPOWER CONTRACT.

Rolling Mill to Purchase All Energy from Illinois Utility —1500-Horsepower Motor to Be Used.

In the plant of the Acme Steel Goods Company, under construction at Riverdale, Ill., an installation is preparing involving 3000 hp. in electrical energy to be supplied by the Public Service Company of Northern Illinois. The Acme Company, which is one of the most important of the concerns in the industry it represents, manufactures band iron for packing cases, barrel hoops and other purposes. Its plant, it is expected, will be in operation by March or April next, running on a 24-hour schedule. Aside from the traction loads this customer's load is one of the heaviest connected to the company's service. The present is the largest power contract made this year by the company.

The details of the Acme Company's installation contain many features of interest, not the least of them attaching to the unusually powerful motors which will be used at several points in the plant. One of these motors, the largest in service on the lines of the Public Service Company, has a capacity of 1500 hp. It is to be installed in the finishing mill, which is one section of the rolling mill. This latter is a Morgan continuous rolling mill, taking billets 2.75 in. square by 30 ft. long and converting these into lengths of 1000 or 2000 ft., according to thickness of band iron being put through. The big motor mentioned which furnishes the driving power here is a 36-pole, 200 r.p.m., 2300-volt, form M, General Electric Company slip-ring motor. This motor will be started as a standard slip-ring motor and after it has come up to speed will be converted into a variable-speed motor by being used in conjunction with a Scherbius regulating set. The motor for this regulating set will be a 355-hp., 2300-volt, form K, General Electric Company motor; generator will be 270-kv.a., 205-volt, type PCR, form A, commutator-type generator.

The machinery in the roughing mill, which is the other part of the rolling mill proper, will be actuated by a big motor also, that is, a 710-hp., 28-pole, 257 r.p.m., 2300-volt, form M, General Electric Company slip-ring motor. Like the other in the finishing mill it will be started as a standard slip-ring motor and after being brought up to speed will be converted into a variable-speed motor by being used in conjunction with a Scherbius speed controlling set. A 230-hp., 720 r.p.m. 2300-volt, form K motor; generator will consist of 170-kv.a., 133-volt, type PCR, form A, commutator-type generator will operate this controlling set.

Throughout the rest of the plant—which will be run entirely by electricity—various three-phase motors up to 100 hp. will be used. One or two 100-hp. motors may be of squirrel-cage type. To supply direct current for various mill motors there will be 100 kw., or 150-kw. motor-generator sets driven by 2300-volt synchronous motor.

Current will be supplied by the Public Service Company from Station No. 4, whence a 12,000-volt line will be extended to a point on the Acme Company's premises, where the customer will install a substation. Three 1000 kv.a. transformers will be used to reduce from 12,000 volts to 2300 volts, delta. It has not been decided yet as to whether an out-of-door substation with selfcooled transformers, or an indoor substation with water-cooled transformers, will be installed.

On the 2300-volt side of the transformers a switchboard will be installed. Part of the shop load, some 400 h. p., will be served through transformers stepping down from 2300 volts to 220 volts. The motors on the roughing mill, finishing mill and the synchronous motor-generator sets will be handled directly at 2300 volts.

COMMONWEALTH EDISON EMPLOYS WOMEN METER READERS.

Experiment Likely to Result in General Employment of Female Labor.

About 25 women are just starting as meter readers for the Commonwealth Edison Company, Chicago. That is the latest development in the employment of women for work which has heretofore been done for the Chicago company by male employes, owing to the enormous demand for man power for the army, navy and industrial purposes in this great war.

The women are first sent to a school for instruction and are then sent out with an experienced meter reader before being assigned a district. The school is in charge of Mr. Arthur Anderson. The equipment consists of chairs and tables, an exhibit of a number of meters and parts of meters, and a large model of a meter dial. This latter is used in meter-reading practice, and examinations are held after the class has been thoroughly instructed by talks accompanied by demonstrations concerning the construction and working of electric meters. Twenty or 30 changes are made on the large dial, each student marking down her record each time on a sheet of paper. These sheets are then collected and checked for accuracy. The report is that the students have made excellent progress and the course seems to be very successful.

At the end of the first day two of the workers proved themselves superior to the more difficult tests, including what are known as "trick reading." Many readings are very simple, as the hands on the dial point unequivocally to certain figures; but in many other cases one or more of the hands will be very close to one of the lines between the figures so that it is easy to make a mistake. There are also several other things to bear in mind, so it may be said that these women showed remarkable aptitude.

Three days is the estimated duration of the school course, whereafter the graduates will start out in their districts, two women together accompanied by an experienced reader.

In commenting on the experiment, the company says, "our experience thus far seems to be the same as that of other concerns who have put women at various kinds of shop work after the brief courses of training. It is reported that properly selected individuals can adapt themselves to the work with as good results as were previously obtained from men. Of course, heavy lifting and other physical conditions unsuitable for women are to be avoided. But in all kinds of work their natural powers are being recognized as considerably more inclusive than most people would have been willing to admit two or three years ago."

COST OF ELECTRIC LIGHT AND THE HIGH COST OF LIVING.

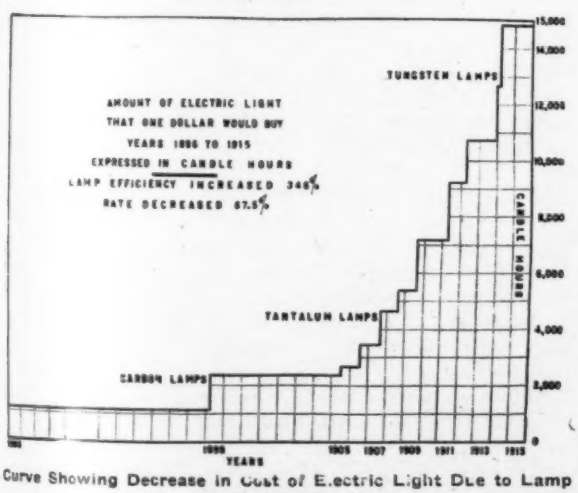
Comparison of Costs Puts Cost of Living in the Limelight Indeed.

With food prices in the United States increasing 69 per cent in the last five years, the Bureau of Labor statisticians have begun a nation-wide investigation into the cost of living, to be used as a basis in making wage adjustments. The inquiry will include several features, the principal one being the gathering of information from families as to their expenditures for one year for food, clothing, housing, fuel, furniture, and miscellaneous expenses.

The Bureau has announced that retail prices for food, as reported July 15, show for 22 essential articles an increase of 3 per cent, as compared with June 15, 1918.

A comparison of retail food prices for July 15, 1918, with prices a year previous to that date shows for all the articles combined an increase of 15 per cent.

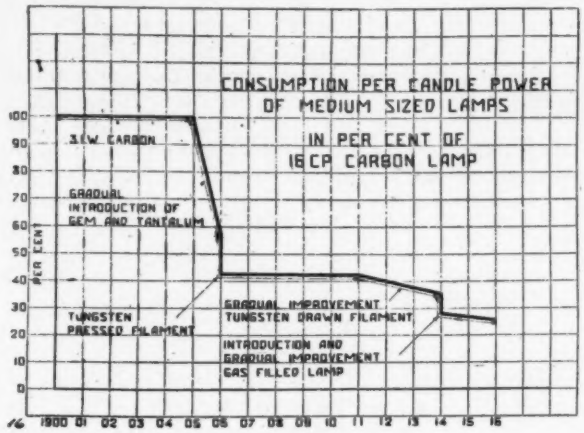
For the five-year period, July 15, 1913, to July 15, 1918, all food combined showed an increase in price of 69 per cent. For every article for which prices are secured by the Bureau there was an increase of over 50 per cent in the five years, and for four articles the increase exceeded 100 per cent, as follows: Meat advanced 123 per cent; potatoes, 105 per cent; lard, 104 per cent, and flour, 103 per cent.



Curve Showing Decrease in Cost of Electric Light Due to Lamp Evolution.

The accompanying curves, gotten up by Peter Junkersfelt, Commonwealth Edison Company, for his paper on electric service in 1916, show the amount of electric light that $1 would purchase during the period between 1886 and 1915; also the consumption of energy per candlepower by medium-sized lamps between the years 1900 and 1916. As an achievement, the increase in efficiency of lamps is almost without parallel. The sure and sometimes radical decrease in the cost of electric light also is almost an isolated incident among the sure increases in costs of other necessities of life.

Many companies are now asking for higher rates



Curve Showing Increase in Lamp Efficiency Due to Lamp Evolution.

because they claim they otherwise cannot keep their systems efficient, cannot remain solid and firmly strong financially. Comparing the rise in living costs with the decrease in cost of electrical illumination, one cannot help but wonder if utilities that are efficient and thus have been enabled to give electric light for minimum cost are not to be allowed to reap the benefit now of their efficiency. Many companies have gloried in their efficiency, their ability to give "service" at such low cost. Yet today they face the necessity of raising their rates or having their system suffer. No one wants higher rates, per se. But if increased rates is the lesser of two evils, let it be increased rates.

ELECTRIC KITCHEN DEMONSTRATES FOOD CONSERVATION.

The Illinois State Council of Defense during the early part of this summer provided an exhibit on the Grand Avenue Pier, Chicago, at which demonstrations were held daily, for about 6 hours per diem, in the canning and preserving of foodstuffs. This exhibition will continue until the close of the present month.

The Grand Avenue Pier is about one mile in length, gas is lacking and electricity naturally suggested itself as being cleanly, easily obtainable, as readily controlled, in fact ideal for the purpose. The Commonwealth Edison supply the pier with electric light, hence physical connection was readily made. The installation consists of 25 kilowatts in heating apparatus, composed of two ovens and several G.E. hotplates.

NEW JERSEY COMPANY SECURES INCREASE.

The Board of Public Utility Commissioners has granted permission to the Atlantic Coast Electric Light Company to increase its rates for service as follows: ten cents per kilowatt-hour for the first 100 kilowatts, and a graduated scale going down to 6½ cents for all over 2000 kilowatts, with a minimum charge of $1.00 for each connected customer, the above applying to commercial metered lighting. New schedules are to be allowed also for alternating current, commercial metered power.

GRAYS HARBOR COMPANY ASKS RAISE OF RATES.

The Grays Harbor Railway & Light Company has filed with the Public Service Commission of Washington an application for an increase in both lighting and power rates. The increase asked in power rates will be 20 per cent and increase in lighting rates from 11 to 23 per cent, according to the class of service. The plan is not to increase the net earnings of the company but to meet additional expenses caused by the increased wages of employes and the increased cost of materials. The officials state that during the past five years, after providing for depreciation, the company has averaged less than 3 per cent on valuations established by the Public Service Commission. The proposed rates have been submitted to the Aberdeen Chamber of Commerce and Commercial Club of Hoquiam, each of which organizations is ready to accept the decision of the Public Service Commission.

FOUR APARTMENT HOUSES REQUIRE 127 ELECTRIC RANGES.

Portland (Ore.) Central-Station Company Makes Noteworthy Progress in Electric Cooking Field.

The Northwestern Electric Company, Portland, Ore., does not carry on a general business in electrical appliances, although it does make a specialty of selling electric cooking ranges to patrons on its light and power lines. Some cooking range sales and installations in new apartment houses in Portland are noteworthy. One of these is Crystal Court, in which 30 ranges were placed, comprising 13 of No. 56 Hughes type, 15 of No. 50 and two of No. 33. In the Volheim Apartments, 23 Hughes ranges were installed, 54 in Imperial Arms, and 20 Westinghouse ranges in the Classic Apartments. Range rates run from a maximum of 8 cents for first 10 kilowatt-hours to 7 cents for the next 11 and 3 cents for the next 50 kilowatt-hours; all in excess of the last named at 2 cents. These rates are for both lighting and cooking, which are computed on the same meter.

In the sale of ranges the terms provide for time payments, which are required to be closed up by the end of 12 months. In handling the sales business for light, power and electric ranges, each salesman is provided with an automobile. They cover an area of city and suburban territory within a radius of 4 miles from the center of Portland.

This company has made good progress in co-operating with electrical contractors and dealers in accordance with that contemplated under the Goodwin Plan.

One feature of the company's publicity efforts in popularizing electric cooking is a series of stickers which are attached to monthly bills and letters sent by the company. The stickers, four of which are reproduced, measure 5 by 2 inches and are attractively printed in two colors.

Notice
THE electricity we supply you with is generated by Water Power; its use at this time for ELECTRIC RANGES will help meet the present national needs in the saving of fuel, food, labor, time and transportation.
NORTHWESTERN ELECTRIC COMPANY
LIGHT—POWER—HEAT
Help Save Fuel and Food
"Cook by Wire"
We sell ELECTRIC RANGES installed complete. EASY TERMS if desired.
NORTHWESTERN ELECTRIC COMPANY
LIGHT—POWER—HEAT
Now is the Time!
For America to correct her unpardonable fault of wastefulness and extravagance. "COOK BY WIRE." you save food, fuel, time, labor and transportation.
NORTHWESTERN ELECTRIC COMPANY
LIGHT—POWER—HEAT
KEEP COOL
Electric Ranges installed complete
"COOK BY WIRE"
We sell electric ranges on easy terms.
NORTHWESTERN ELECTRIC COMPANY
LIGHT—POWER—HEAT

Four Stickers of a Series Used by Northwestern Electric Company on Monthly Bills, Letters, Etc.

SALINA CITY OFFICIALS PRAISE UTILITY.

It is far from being a usual occurrence for the officials of any city to issue a general letter in praise of a public utility, but such good fortune has befallen the Salina (Kan.) Light, Power & Gas Company, of which W. E. Quillin is manager. Only a short time ago the Salina city council passed an ordinance granting additional revenue to the company upon being convinced that the burden would fall upon the large, rather than the small, consumers of electric current.

Extracts from the letter of praise are as follows:

"Several years ago the present company took over the electric light and gas interests of this city. Since taking charge they have expended an enormous amount of capital improving the same, which was practically rebuilding the lines, and at the same time maintaining service to the city and individual customers. The relation between the city and the company has always been satisfactory in every respect.

"One year ago the company voluntarily reduced their rates 2 cents per kilowatt-hour to private customers, which was absolutely voluntary on their part as the franchise provides for the rate in effect at that time.

"The city has had arc light prices reduced and has had several other concessions from the company in the way of park lights and other public benefits.

"We have always found the different managers who have had charge of the plant in this city willing to meet the city's demands on any reasonable proposition, and have in some instances done more than we really expected. It has been a pleasure to transact business with a corporation of this kind."

The letter is signed by the mayor.

FORTLAND COMPANY TO RAISE RATES.

The Portland Railway, Light & Power Company, which was recently granted six-cent car fare by the Public Service Commission of the state, has asked for permission to increase rates for heating, light and power. The company states that the present rates were based on operating conditions prior to December 31, 1916, since which time the cost of operating has greatly increased.

Operating

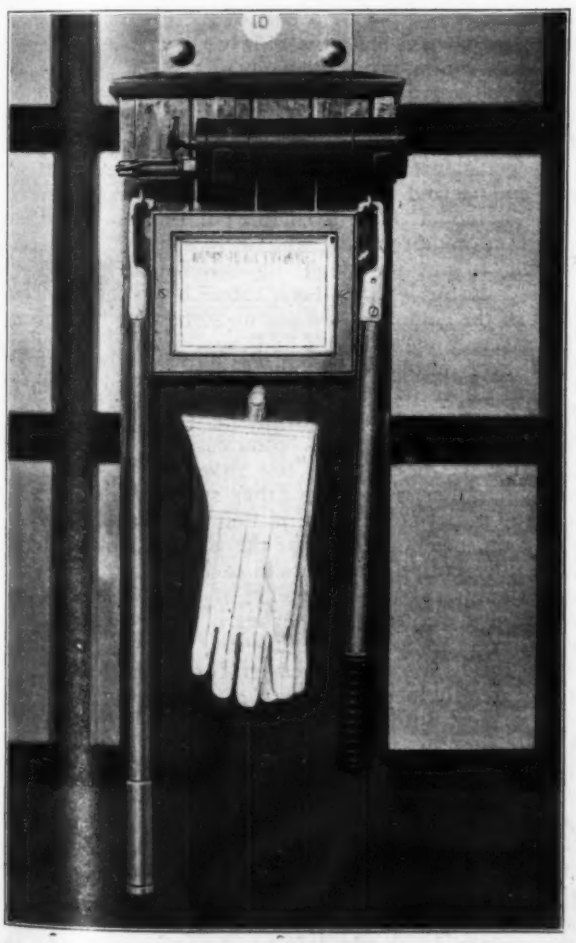
Locating Station Safety Appliances — Standardized Railroad Crossing Specifications — Street Lighting Schedule

STANDARDIZING LOCATION OF SAFETY APPLIANCES.

Method in Vogue by Philadelphia Electric Company Makes for Safety.

In station operating many things happen suddenly and unexpectedly, tending to cause excitement on the part of the station operator, resulting possibly in mistakes and accidents to persons, apparatus and service. There is a somewhat natural tendency sometimes for men to forego, on the spur of the moment, the use of rubber gloves, the rubber mat or the stool when working on circuits that are supposed to be dead but might be alive; and to do similar things that may put their lives in jeopardy, and that are at best not in keeping with the creed of safety.

Excitement is often the predominating cause of this form of carelessness or thoughtlessness. But another cause may be that the rubber gloves or similar piece of equipment cannot be found or is far-removed from the place where wanted. The accompanying illustration shows a pair of rubber gloves, clip or fuse pullers and fire extinguisher all mounted together in a substation of the Philadelphia Electric Company. In this way there is practically no tendency on the part of an operator to snatch a clip puller without taking up also the rubber gloves. If a fire extinguisher is needed an operator instinctively knows where to go to find it.



Desirable Policy of Keeping Rubber Gloves, Fuse and Clip Pullers All Together Where Readily Accessible.

By the above arrangement, and keeping these safety appliances in a convenient location in a station, so as to be readily accessible, the likelihood of accidents is reduced, station operating can be more quickly and safely carried on, and the probability is that rubber gloves and similar somewhat delicate apparatus will be better cared for and have longer life, therefore.

STANDARDIZED SPECIFICATIONS FOR TRANSMISSION LINE RAILROAD CROSSINGS.

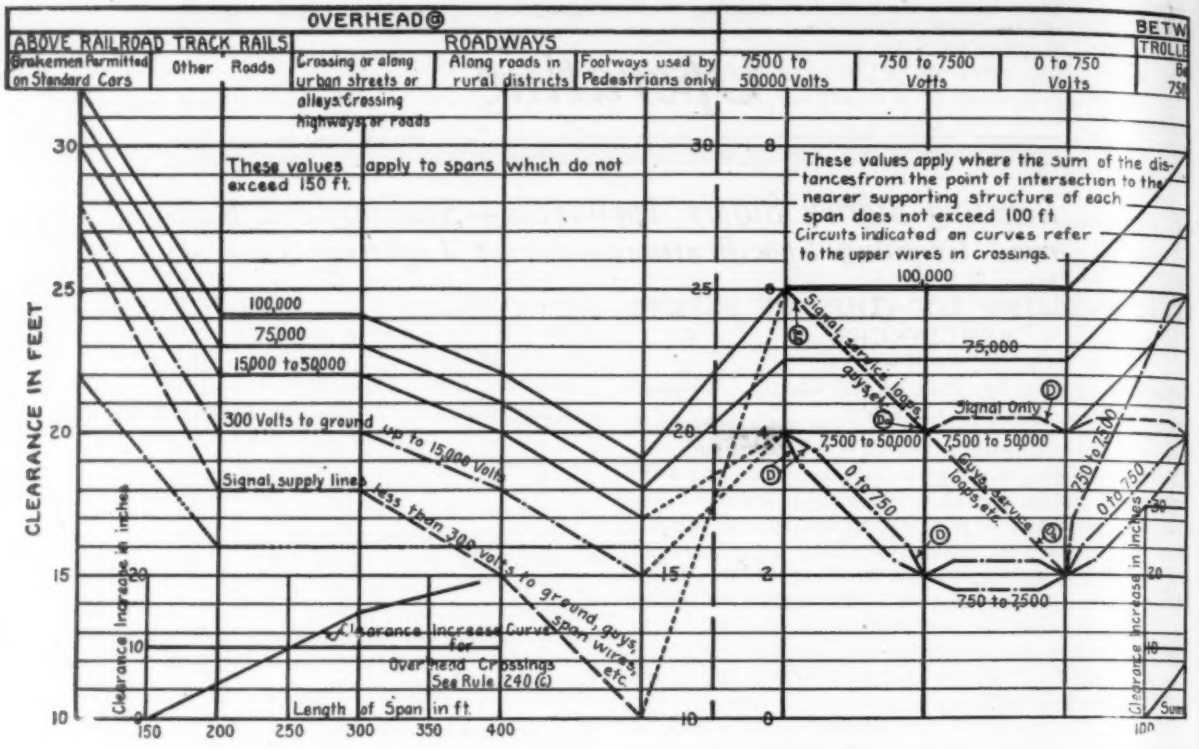
Recommendations and Chart of Bureau of Standards.

At the annual convention of the Ohio Electric Light Association held at Cedar Point during June, Dr. M. G. Lloyd, electrical engineer, Bureau of Standards, discussed at some length the crossing of railroad tracks by overhead conductors, with especial reference to the National Electric Safety Code. Referring to the table of overhead specifications given in the O. E. L. A.'s report, which was reproduced in the ELECTRICAL REVIEW, issue of July 20, Dr. Lloyd pointed out the divergence in the requirements made by railroads upon electric light and power companies. Uniform requirements and standardization are to be greatly desired, and the power companies of Ohio were advised to take up the matter with the state utility commission, as has been done in some other states.

Dr. Lloyd then went on to point out that the National Electrical Safety Code gives more reasonable requirements covering this matter than anything prepared by any one state, or some enforced where it is possible for them to do so by the railroads in the state.

Discussing the table shown in the ELECTRICAL REVIEW, issue of July 20, presented at the convention by the Transmission and Distribution Committee, Dr. Lloyd pointed out that it was impossible to cover every condition that might come up in practice in a table. In the table in certain cases sets of values have been given rather than single values—that is, the clearance or separation between conductors must depend upon such things as voltage, for instance, and values for only a few different voltages are given in the table. This is true with regard to separation between different wires of a line, and also in regard to the clearance between the power line and other wires crossed over, such as telegraph wires which parallel the railroad track.

The table gotten up by the Association and appear-

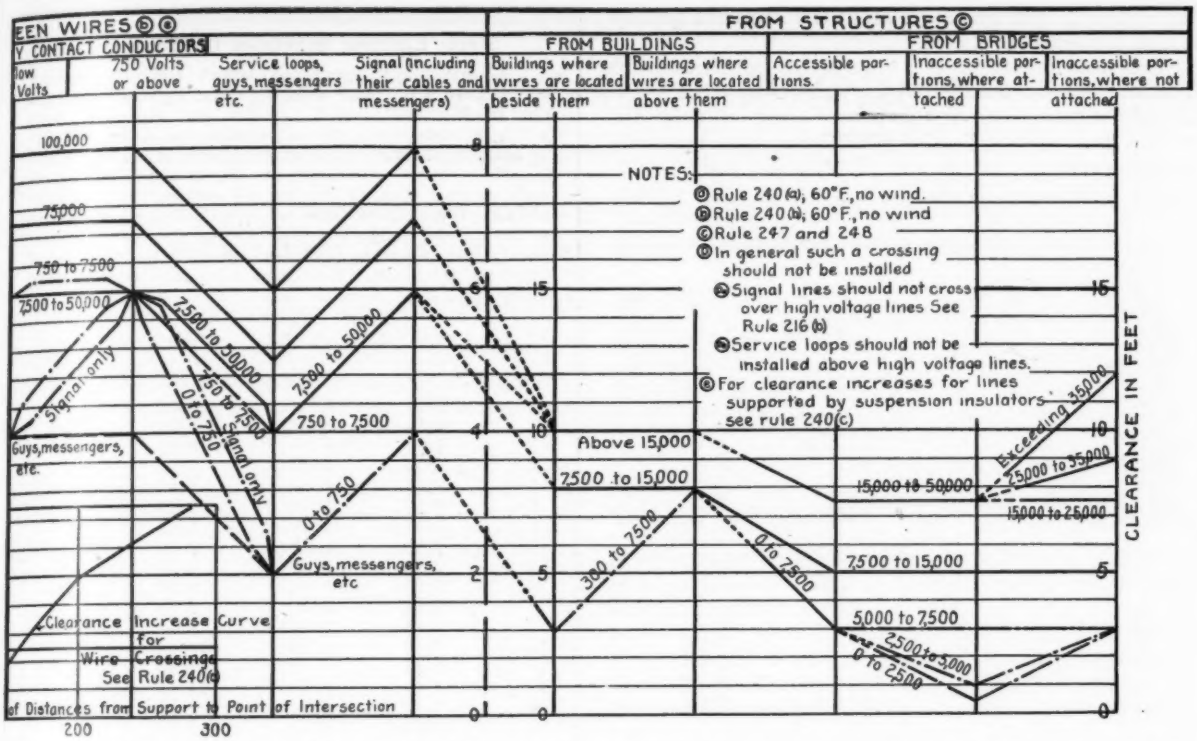

OVERHEAD
ABOVE RAILROAD TRACK RAILS
ROADWAYS
Brakemen Permitted on Standard Cars
Other Roads
Crossing or along urban streets or alleys Crossing highways or roads
Along roads in rural districts
Footways used by Pedestrians only
7500 to 50000 Volts
750 to 7500 Volts
0 to 750 Volts
These values apply to spans which do not exceed 150 ft.
These values apply where the sum of the distances from the point of intersection to the nearer supporting structure of each span does not exceed 100 ft
Circuits indicated on curves refer to the upper wires in crossings.
100,000
75,000
15000 to 50000
300 Volts to ground
Signal, supply lines
less than 300 volts to ground, guys, span wires, etc.
Signal service loops, guys, etc.
Signal Only
7,500 to 50,000
750 to 7500
0 to 750
Curve service loops, etc.
CLEARANCE IN FEET
Clearance increase in inches
Clearance Increase Curve for Overhead Crossings See Rule 240 (c)
Length of Span in ft.
150
200
250
300
350
400

ing on page 102 of the ELECTRICAL REVIEW, said Dr. Lloyd, contained several errors. The conductor loading specified by the Safety Code should have been with ½-in. ice instead of ¼-in. In the column of conductor clearances, the National Electrical Safety Code value for 33,000 volts should be 22 in. instead of 21 in. The three values for the clearance between pole and conductor should be 5, 10 and 18 in. instead of 9, 12 and 26 in. The American Railway Association (Baltimore & Ohio Railroad) specification requirements for clearance between pole and conductor for 14,000 volts should read 12 in. The minimum size for ground wire required by the National Electrical Safety Code is 6 instead of 4 in. The Safety Code requires a minimum top diameter for wood poles of 7 in., and both poles and cross arms are required to have sufficient strength to meet the specified loading.

Concerning the last column, headed "Remarks": There is a provision in the Safety Code with respect to deterioration of lines, for in time, poles do deteriorate; they rot, especially around the base, and their strength gradually decreases until they have to be replaced. The Safety Code states very definitely to what extent a pole shall be permitted to deteriorate. Our requirements for strength are less than some of these other specifications call for, but we set a very definite limit as to the point to which a pole shall be permitted to deteriorate before it is replaced. We think that that is a more reasonable kind of a requirement to make.

The Safety Code requirements are not set out as a model of construction; they are set up as minimum requirements of what should be enforced. They give, however, range for the application of engineering ability in the design of your lines. It is not felt that standardization should reach a point where it leaves nothing for the engineer to do. The Safety Code aims to make requirements which are a minimum and which should be met in all cases. Good engineering judgment, however, will very often dictate a better construction than the Safety Code rules call for. To illustrate, if you put up a pole of merely the minimum strength that will meet the Safety Code rules, it means that you would probably have to replace that sooner than good engineering would call for; in other words, it would pay to put up a stronger structure and have it last longer; but that is a matter which so far as the rules go is left to the discretion of the engineer. It was emphasized that the Safety Code is not intended to be a model of construction; it merely represents minimum requirements, and it is usually good engineering to put up something better than the Safety Code calls for. It has been found by experience that most of the companies do put up something better than the Safety Code calls for and they, in fact, more than meet the requirements of the Code.

The above indicates some of the reasons why it is felt that it would be an advantage if this matter comes up before state utilities commissions, to advocate adoption of the Safety Code rules by the state commission rather than some other specifications. There are additional advantages in that it is better to establish a uniform standard for the whole country than to have different requirements in each state; it affects the manufacturers of equipment; it affects the holding companies who have properties in different states and who expect to do their engineering largely in one main office. It is very much easier for them to meet one set of requirements as to all of their properties than it is to meet different requirements in each state. It is easier for the manufacturer to put out equipment which meets one set of rules rather than have to make up equipment in one state to meet one set of rules and in some other state to meet some other set of rules; so that as a general proposition there are advantages in having a single standard in all of the states rather than to have something different adopted in each state, and there is a very great tendency to do that thing if the matter is simply left to state commissions. In Iowa, when the matter was up last fall, the Iowa As-



sociation looked at it in that light and advocated the adoption of the Safety Code by the state commission. In Pennsylvania, on the other hand, different specifications were prepared locally and adopted there, not only with the consent but with the advice of the Electric Light Association; if they had it to do over again their attitude would probably be different; they have come to realize that they made a mistake in not adopting the Safety Code in that state, and that is the general trend of opinion all over the country. The Safety Code has received broader and deeper study in its detail and in its preparation, and it is the most complete and most reasonable set of rules that has been drawn to cover this subject.

A great many men find the Safety Code somewhat complicated because it goes into details to take care of variations in conditions. The accompanying chart, gotten up by the Bureau of Standards, goes into this matter of clearances and shows by inspection of the diagram just what clearance would be required in any particular case. By making use of a diagram it is possible to at once pick out the requirements for any particular case. The variation with length of span is given, also the variation with voltage and the variations for different kinds of lines, instead of having to worry through the rules and compute for yourself, you can pick them out from the diagram. The Safety Code requires three different grades of construction for power lines, depending upon the voltage of the line and upon the particular kind of crossing, i. e., whether it is over a railroad main line, or a siding, or over a telephone line, etc. There is another tabular diagram which shows at a glance what particular grade is required in any particular case.

BURNING A MILLION TONS OF COAL A YEAR.

The supervision of the burning of a million tons of coal a year is no small problem, particularly in these times when obliged to take fuel that is unsuited to the furnace conditions of the various plants, some stations being equipped with mechanical stokers of various types and designs, and others with ordinary grates and hand firing, said Frank W. Casler, general superintendent of production, Public Service Corporation of New Jersey, in an address before the convention of the Smoke Prevention Association, composed chiefly of smoke inspectors of municipalities, railroads, etc., which was held in Newark, N. J., on August 20 to 22.

The method of procuring a coal supply today has changed very materially from what it was in pre-war times; in other words, the pooling of coal gives practically one grade for all plants, and it is no longer possible to select low volatile coals that are so necessary in hand-fired plants in order to eliminate the smoke nuisance.

Previous to the war, our contracts called for coal to be delivered to hand-fired plants, where smoke abatement was an important factor, of not more than 17 or 18 per cent volatile matter, but now the average volatile in the coal for all of our plants ranges from 23 to 25 per cent, adding greatly to the difficulties in trying to handle the smoke prevention problem effectively.

The method of purchasing coal in vogue with Public Service Corporation is a very simple one; the contracts specify the average ash contained for any one month shall not exceed a certain percentage. Sufficient leeway is allowed for reasonable variation, and should it exceed this amount, penalties are enforced, but no premiums are paid if the average falls below the specification in the contract; the object being to maintain as nearly as possible a uniform supply of fuel. The method employed of arriving at the quality of coal is this:

A sample of about 1000 pounds of coal is assimilated from every 500 tons as it is received, from which small samples are prepared in the usual way of grinding, quartering, etc., and properly marked, are then sent to the laboratory for the customary coal analysis.

The different analyses are averaged up at the end of each month, and if the ash content has not exceeded

that specified, it is considered that the standard quality of coal has been furnished.

Previous to war times a number of penalties were applied and considerable money was refunded. These refunds showing up in the power costs as they did proved that our method of purchasing coal was reasonably correct. All of our 16 principal plants, generating approximately 90 per cent of our total power, are equipped with water meters which give periodically an evaporation test of each day's performance in the boiler room.

Further, frequent tests are made of engines and turbine units to see that the amount of steam generated is being used efficiently, and each engineer operating one of our plants has prompt knowledge of the quality of coal he is getting and the over-all efficiency that should be obtained; he is in position to detect waste very promptly and correct this waste so that all plants are always maintained at their maximum.

TRANSMISSION LINE PROGRESS CHART

In the erection and construction of transmission lines, traversing as they do in many cases long distances, the need for definite and yet concise progress reports is pronounced. Gangs of men often move from camp to camp with the progress of the line, only coming into town once a month or so. Materials have to be delivered where wanted, otherwise the cost of doing the work, delays and disorganization are bound to follow.

By drawing up a simple yet complete form of progress chart, which may be mailed or in some other way gotten into headquarters or office of the engineer, delays and loss of material can be avoided, and the work may be prosecuted with despatch at minimum cost. The accompanying illustration shows part of one form of progress chart that is at once convenient, accurate and simple. To make it complete requires a minimum amount of effort on the part of the foreman and little actual writing at that. Yet it tells the tale.

The chart covers one week's work. Progress obtained during the week is indicated by filling in the squares in blue, while the preceding progress is shown in red. This form of chart is about as fool-proof as it is possible to make such a report. A profile in addition to the map shown is also included in the progress chart, but this is not here shown.

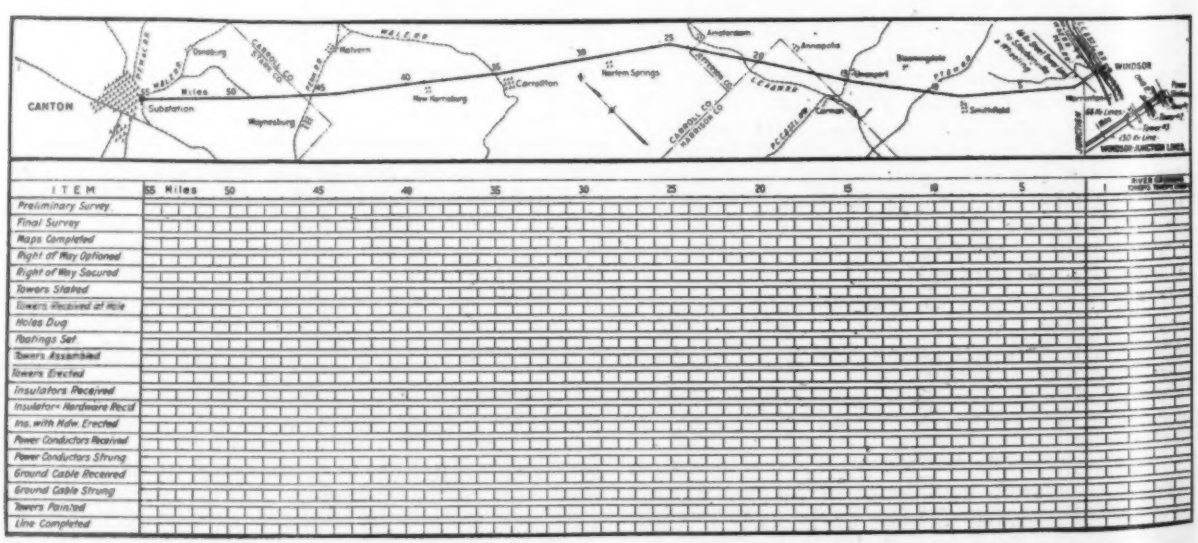
Street Lighting Schedules for September.

Every plant operating street lighting circuits must have a definite schedule for lighting and extinguishing the lamps. Below are given the two most commonly used schedules as compiled for next month. The table is compiled for latitude 40° North. Since throughout September the daylight-saving plan of having all clocks set one hour ahead of standard time will be followed, the time given in the table (instead of being mean local or solar time, as is usually indicated in general street lighting schedules) has been advanced one hour in each case.

SEPTEMBER, 1918.

Night of Sept.	All-Night Schedule.		Moonlight Schedule.	
	Light.	Extinguish.	Light.	Extinguish.
1	8:05	6:00	8:05	4:30
2	8:00	6:00	8:00	5:30
3	8:00	6:00	8:00	5:30
4	8:00	6:00	8:00	5:30
5	7:55	6:00	7:55	5:30
6	7:55	6:00	7:55	5:30
7	7:55	6:05	7:55	5:35
8	7:50	6:05	7:50	5:35
9	7:50	6:05	7:50	5:35
10	7:50	6:05	8:30	5:35
11	7:45	6:05	9:05	5:35
12	7:45	6:10	9:50	5:40
13	7:45	6:10	10:45	5:40
14	7:40	6:10	11:40	5:40
15	7:40	6:10	11:45	5:40
16	7:40	6:10	1:55	5:40
17	7:35	6:15	3:05	5:45
18	7:35	6:15	4:20	5:45
19	7:35	5:15	No light	
20	7:30	6:15	No light	
21	7:30	5:15	No light	
22	7:30	6:20	7:30	8:55
23	7:25	6:20	7:25	9:40
24	7:25	6:20	7:25	10:25
25	7:25	6:20	7:25	11:20
26	7:20	5:20	7:20	12:20
27	7:20	6:20	7:20	1:20
28	7:20	6:25	7:20	2:35
29	7:15	6:25	7:15	3:25
30	7:15	6:25	7:15	4:25

Tables for each month of the year, rules for the two schedules given above and for modifications of them, corrections for standard time and latitude, monthly and yearly total hours of burning for the five most common schedules, as well as other information pertinent to the subject, are printed in a booklet obtainable from the ELECTRICAL REVIEW for 25 cents a copy.



Weekly Progress Chart for Transmission Line Construction.

Contracting-Construction

Croft's Comments on Fishing—Electrical Work on Ships—Rebabbitting Bearings—Pull Boxes—Among Contractors

A FEW FACTS ABOUT CONDUIT FISHING.

Fishing Methods Classified—The Fishing Wire or Tape—How to Facilitate Fishing by Lubrication and Use of Pull Boxes—Number of Bends Allowed.

BY TERRELL CROFT.

[This is the third of a series of seven articles by this well-known author in which he describes and illustrates the best methods and equipment for fishing conduit. On account of the increasing use of conduit systems, this matter is steadily becoming more and more important, so that a discussion of the subject is of timely value.]

Fishing Methods May Be Classified Into Three General Divisions, as follows:

(1) Manual wire fishing.
(2) Pneumatic fishing.
(3) Machine fishing.

In manual wire fishing a wire or tape of flexible spring steel is forced by hand through the tube from outlet to outlet. Then the conductors which are to be installed in the conduit may (unless they are too heavy and the run is too long) be drawn in by pulling back the fish wire; if the conductors are large and the run long, it may be desirable to draw another heavier line, called a "pulling-in line," into the duct whereby the conductors can be drawn into it.

Pneumatic fishing consists in forcing with air pressure a fishing line through the duct from outlet to outlet. The fishing line being in place in the tube, the conductors may be drawn in with it as with a fish wire, or a pulling-in line may be drawn into the tube with this fishing line.

In machine fishing, a flexible spring-steel tape is impelled through the conduit run by a specially designed machine. Then the conductors may be pulled in with the ribbon as it is drawn back by the machine, or a pulling-in line can be threaded into the tube as the machine winds back the tape. Each of the three methods above defined will be described in the order enumerated in subsequent articles of this series.

Heavy Runs Should Not Be Pulled Into the Duct With the Fish Wire, because such a treatment will tend to abstract the "life" from the steel. Although the steel wires used for fishing are very strong considering their cross-sectional areas and will sustain a surprisingly large stress without rupture, they will lose their "springiness" and hence be valueless if they are strained beyond the elastic limit. Experience has shown that this elastic limit can be exceeded more readily than is usually believed. If a run pulls in hard, do not try to pull it with a fish wire. Pull the wire back and draw in a suitable pulling-in line of ample strength and draw in the conductors with it.

The Kind of Wire to Use for Manual Wire Fishing depends somewhat on conditions. Ordinary No. 14 round galvanized steel wire can be used for fishing short runs. For long runs or runs where it is desirable to employ the fishing wire as a pulling-in line for relatively large conductors, No. 10 galvanized steel wire can be employed. However, for most effective fishing, a spring-steel ribbon or tape about ¼ inch wide and 0.03 inch thick is desirable. The dimensions of the different sizes of fish wire and discussion of their uses as regards their application for work in new structures is treated rather fully in the author's "American Electricians' Handbook,"* hence none of the information there given will be repeated here. Information relating to wire fishing in old buildings is given in the author's "Wiring of Finished Buildings."* While steel fish ribbons can be obtained in lengths up to about 200 feet, a length of 50 feet is most suitable for average use.

Fish Wires Should Be Lubricated, particularly where long runs are to be threaded. It will be found that fishing may, in certain cases, be much more effective if lubrication is employed; that is, with it longer runs can be threaded and with less effort. Proper lubrication permits the fish-wire end to slide much more readily through the tube. Either of two lubricants—oil ar paraffin—may be used. It should be noted, however, that the best way to insure easy fishing is to provide plenty of pull boxes in long and difficult runs, thereby minimizing the distance and number of bends between outlets. This, however, is discussed in the next paragraphs.

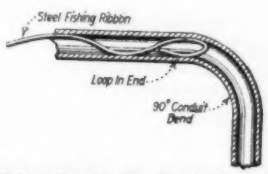


Fig. 5.—Fishing Ribbon Buckled in Conduit at a 90-Degree Bend.

In general, oil should be used with caution as a lubricant for a fish wire. If it is used at all, only kerosene, which will evaporate readily, should be employed. Greases should never be applied. The objection to ordinary lubricating oils and greases is that all of them act chemically upon the rubber insulation which encases the conductors that will ultimately be drawn into the duct. They render it spongy and finally decompose it, making it worthless. One can observe this action by noting the effect of oil on a rubber washer. To lubricate a fish wire with kerosene, it may be wiped as it is passed into the tube with a small rag saturated with the oil.

Paraffin probably is the best fish-wire lubricant in that it has no deleterious effect either upon the metal of the tube or on the insulation of the conductors. Paraffin is of itself one of the very best insulators. To lubricate the fish wire with paraffin, its forward end is rubbed on all sides with a piece of the wax and the remainder of the line can be similarly treated as it is forced into the duct.

Powdered graphite has in certain instances been used for lubricating fish wires, but it is difficult to

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*These books by Mr. Croft can be purchased through the Book Department of the Electrical Review.

make it stick to the wire unless it is mixed with some oil, hence, in general, its use is not very practical. While it does not act on the rubber insulation, its use is not to be recommended because it is a fair conductor; if the insulation is weak at any point, the graphite rubbed into it may facilitate breakdown of the insulation and the grounding of the conductor.

Powdered soapstone or talc is also used as a lubricant with excellent results. It is a good insulator.

The Contour and Arrangement of Conduit Runs affects the cost of fishing and the time required therefor. Every offset or turn introduced between outlets in a conduit run increases materially the difficulty of fishing that run. A run 100 feet long without any turns or offsets can be fished very readily with a good fishing tape, but a run 15 feet long containing a number of offsets and turns may be difficult or even impossible to fish. Furthermore, it is very tedious to pull conductors into a run which contains a number of bends. Every bend introduced in a run between outlets means that just that much more stress must be imposed upon the conductors in pulling them in. With a large number of bends, such a stress may become so excessive that the conductors may be strained and weakened. Their cross-sectional areas may, therefore, be uniformly, or only at weak points, materially reduced. Such reduction of section tends to cause local overheating of the conductor in the conduit when it is carrying current. Moreover, every bend strains and weakens the insulation so that the liability of short-circuits or grounds is materially increased. It is for these reasons that the number of bends between outlets is, as described in the following paragraph, limited by the National Electrical Code.

There Should Not Be More Than the Equivalent of Four 90-Degree Bends Between Outlets. Rule 28*h* of the National Electrical Code reads:

"All elbows or bends must be so made that the conduit will not be injured. The radius of the curve of the inner edge of any elbow not to be less than 3½ inches. Must have not more than the equivalent of four quarter bends from outlet to outlet, the bends at the outlets not being counted."

By a "quarter bend" is meant one of 90 degrees, that is, a right-angle bend. Hence, there is allowed, "not counting the bends at the outlets": $4 \times 90 = 360$ degrees change in direction of the conduit run between outlets.

Fig. 5 illustrates what occurs when an endeavor is made to fish a conduit run containing a large number of bends. The fish wire buckles at one of the elbows instead of passing around it. Due to the fact that there are a number of other turns between the elbow which

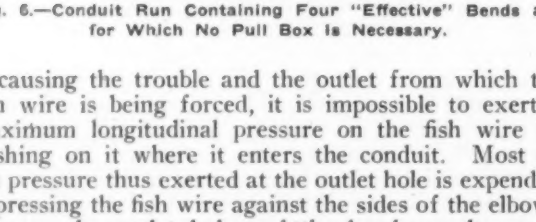


Fig. 6.—Conduit Run Containing Four "Effective" Bends and for Which No Pull Box Is Necessary.

is causing the trouble and the outlet from which the fish wire is being forced, it is impossible to exert a maximum longitudinal pressure on the fish wire by pushing on it where it enters the conduit. Most of the pressure thus exerted at the outlet hole is expended in pressing the fish wire against the sides of the elbows between the outlet hole and the bend, as shown in Fig. 5.

Thus in Fig. 6 is diagrammed a run between the outlet boxes *A* and *B* which contains the maximum number of 90-degree bends—that is, four—between outlets. Bends *X* and *X* near the outlets are not counted. With the run shown in Fig. 7 there would, were it not for the insertion of the pull box *P*, be six effective bends between outlets *C* and *D*, but with the

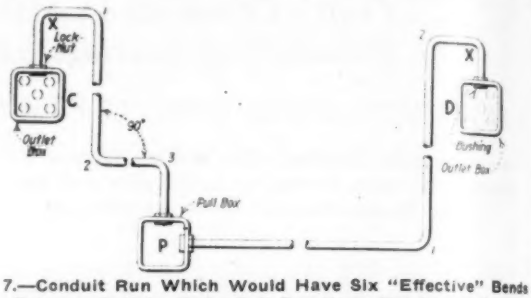


Fig. 7.—Conduit Run Which Would Have Six "Effective" Bends Between Outlets, if the Pull Box Were Not Inserted.

insertion of the pull box, which is itself an outlet, there are only two effective bends between *P* and *D* and three effective bends between *C* and *P*.

Manual Wire Fishing May Be Treated Under Two General Classifications:

(1) One-way fishing, and
(2) Two-way fishing.

One-way fishing is that where but one fish wire is used and it is manipulated or pushed entirely through from only one end or outlet of the conduit run. Two-way fishing is that for which two fish wires, one pushed in from each outlet of the conduit run, are utilized. The two wires are then manipulated until their hooked ends engage somewhere inside of the conduit, after which one of the wires is pulled through by the other.

(To be continued.)

ELECTRICAL INSTALLATIONS ON WOODEN SHIPS BUILT IN PORTLAND.

The Jagger-Sroufe Company, electrical engineers and contractors, Portland, Ore., has had much of the electrical work on the numerous wooden ships completed and under construction in the Portland shipyards. Included in this was the electrical work on several ships built for the French government as well as those for the Emergency Fleet Corporation of the United States.

These, of course, are all steamships, each requiring an auxiliary electric plant to produce energy for lighting, service motors, signal and telephone systems, and the wireless apparatus. The installations consisted of the General Electric, 15-kw., direct-current marine generators, switchboards and other accessories. On the United States ships the Kilbourne & Clark wireless apparatus was installed, and that of the Cutting-Washington Company on the French ships. A special feature of the electrical work was the wiring in conduit, and in connection with which steam-proof fittings were used. This work required extreme care and thoroughness.

POURING AND SCRAPING BABBITT BEARINGS.

By C. P. Macey.

When the bearings of machines have become worn so badly that rebabbitting is necessary, the work can easily be done with a trifling expenditure of labor.

One good method is illustrated in Figs. 1 and 2. The first illustration shows the top view of a bearing (which is to be babbitted) with the shaft in place and the top half of the bearing removed. Usually in babbitting bearings, each half of the bearing is babbitted separately. However, with the method to be described, both can be poured at once.

First, the two liners *B* are cut of sheet iron, wood or leather with notches in the edge of each. The

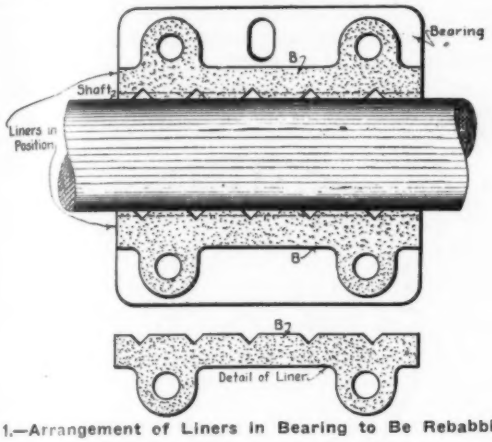


Fig. 1.—Arrangement of Liners in Bearing to Be Rebabbitted.

notches are to permit the babbitt metal to flow from one-half of the bearing to the other. Then these liners are clamped between the cap and base of the bearing as shown in Fig. 2. The shaft around which the babbitt is to be poured must be carefully centered in the bearing and for this purpose a couple of small pieces of leather belting or blocks of wood are placed in the bottom half of the bearing to hold the shaft in position. Obviously the liners must be of such a thickness that with the two halves of the bearing clamped tightly in position, as in Fig. 2 with the liners between them, the shaft will be centrally located. Pasteboard rings, as shown in Fig. 2, can be cut and fitted around the shaft at the bearing ends to prevent the molten metal from leaking out around it. Clay or putty may also be packed around the end of the bearing where the shaft sticks through to further prevent metal leakage. After the metal has been poured and cooled, the two halves of the bearing can be separated with a hammer and a cold chisel.

After a babbitt-metal bearing has been poured in the box, using the shaft as a core or mold, it should then be scraped so that it will accurately fit the shaft. If the scraping is omitted, heating or excessive frictional losses are liable to result. About the best tool for this purpose is one specially manufactured which

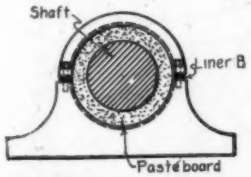


Fig. 2.—End of Bearing Showing Liners and End Shield in Place.

is of triangular cross-section and which looks like a three-cornered file without the teeth. If such a tool is not available, one may be improvised by grinding, with an emery wheel, the teeth from an old three-cornered or half-round file. The faces of this home-made tool should be honed smooth. The scraping is done with the edges, which must be sharp, if good work is to be done.

Now, the portion of the shaft which is to rotate in the bearing that was babbitted is painted a thin coat of either lamp black or Prussian blue oil paint of the sort that is marketed in metal tubes for artists; in place of this red lead or graphite mixed with a little oil may be used. Then, the painted shaft is placed in the bearing. It is turned by hand for a few rotations and removed. At the few points where the shaft contacts with the bearing metal, paint from the shaft will be left on the babbitt. These spots, where the paint is left, are the only ones where the shaft touches. Each of these spots should be scraped—that is, babbitt metal removed—with the scraping tool. Again the shaft is painted and then rotated in the bearing and the new high spots scraped off. The process is continued until, when the painted shaft is turned, the paint from it is found to be evenly distributed over the entire surface of the bearing. This is an indication of uniform contact. When the scraping is started, the bearing bolts need not be drawn down tightly. But, as the process proceeds, the bolts should be drawn up until at the finish the bolts should set snugly in their normal positions. The thing desired is a good "running fit," that is, while the shaft should rotate easily in the bearing without bending, there should be no play or "give."

PROPER DISTANCES BETWEEN PULL BOXES.

By Arthur Werner.

There appears to be considerable difference of opinion between wiremen as to the maximum distance that should be allowed between pull or outlet boxes in conduit wiring systems. The writer has always maintained that it is poor economy to so lay out a conduit run that the distance between pull boxes will exceed 150 ft. It is believed that, all things considered, it is better to so lay out the work that it will not be necessary to pull wires for more than 100 ft.

Installations have been made wherein the pull boxes were 250 ft. apart. In these installations it took a great deal of time to get the snake through the conduit, and it took more time to pull the conductors through after the pulling-in line had been fished through with a snake. Furthermore, the long pull did some damage to the insulation on the conductors. The writer thinks that there should be a rule in the National Electrical Code which would limit the distance between pull boxes in conduit runs, in which the size, and strength, therefore, of wire is an important factor.

AMONG THE CONTRACTORS.

The Live Wire Supply Company, Macomb, Ill., has been awarded the contract to build a transmission line from Dallas City to Blandinsville and Stronghurst, Ill., for the Western Illinois Utilities Company, of LaHarpe, Ill. The Utilities company furnishes the material. The line is 44 miles long.

Jagger-Sroufe Company, Portland, Oregon, recently completed the wiring for lights and motor lifts for the bridge of the Spokane, Portland and Seattle railroad at Harrisburg, Oregon. Another piece of work was that of moving the electric pumping plant of the North Coast Power Company to a new location. This plant serves to pump water from wells to supply the city of Vancouver, Wash.

QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be submitted preferably within eight days of the date of publication of the question and should be limited, if possible, to 300 words. Payment will be made for all answers published.

Questions.

No. 437.—Trolley Feeders.—The outer braid covering of feeder cables for trolley lines has a tendency to go to pieces after a few years, causing the same to hang down in dilapidated condition and affording excuse for complaints of unsightliness along the streets. Would painting or other treatment of the braid prevent this trouble and extend its life? Since trolley wires are bare, why is there any greater need of covering the trolley feeders, which are much less likely to fall down?—J. C. N., Seattle, Wash.

No. 438.—Reliable Safeguarding of Flatirons.—What is regarded as the most reliable method of safeguarding an electric flatiron so that it will not constitute a fire hazard when left indefinitely with the current "on"?—T. H. W., Yonkers, N. Y.

No. 439.—Motor-Starting Trouble.—We have a 50-hp., three-phase induction motor direct-connected to a large ventilating fan. It is a 60-cycle, 220-volt machine controlled by resistances in the secondary circuit. In starting the motor recently we have noticed that it starts much slower than formerly, but after it gets up to about half speed and the controller is moved to the next notch, it suddenly takes a spurt and comes up to full speed quickly. I thought the trouble was in the grid resistances, but have examined and tested them repeatedly without finding any trouble there or in the connections. What is the probable cause of the difficulty?—D. W. E., Joliet, Ill.

Answers.

No. 433.—Motor Bearings.—What grade of babbitt metal is best for use in the bearings of 50, 75 and 100-hp. induction motors operating at 720 r.p.m.? A chain drive is used and of necessity very little slack is allowed. Also what is the difference between the inside diameter of an assembled bearing and the outside diameter of the shaft of the motor the bearing is used with?—W. B., Mt. Union, Pa.

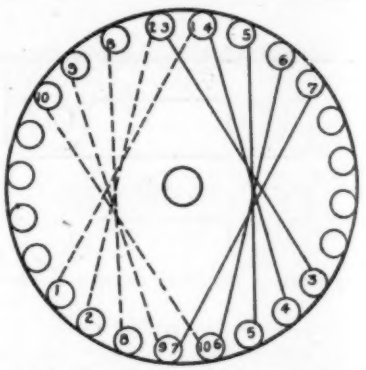
Answer A.—The best grade of babbitt for induction-motor bearings is "high grade hard babbitt" which contains approximately 87 per cent of tin; and although this is the highest price metal on account of the large percentage of tin, it is the most economical because of the long service and reliability which is obtained. The diameter of the bearings of induction motors of 50 to 100 hp. at 720 r.p.m. will range from 3¼ to 4¼ ins. and for solid bearings of these dimensions, the difference in diameter of the shaft and bearings should be 0.002 in. per inch of diameter. The actual clearance should, therefore, be between 0.006 and 0.008 in. If the bearings are split, the allowance should be 0.001 in. per inch of diameter for the above mentioned sizes, in which case the clearance should be between 0.003 and 0.004 in. In addition to the clearances given, split bearings should be relieved at the split to about 30 degrees below, in order to avoid pinching. This is the practice followed by one of the largest manufacturers of induction motors.—C. H. H., Swampscott, Mass.

Answer B.—On motors of 50, 75 and 100-hp. the bearings are generally made of copper-base bearing alloys (known as bronzes) consisting of the following classes: (a) copper and tin, (b) copper, tin and zinc, (c) copper, tin and lead, (d) copper, tin, lead and zinc. Occasionally small quantities of other metals are included for various purposes. Babbitt or tin-base bearing metals are used on machines where the speed is low and the air gap large. For induction motors the air gap is so small that the softer bearing metals cannot be used. It is necessary to use the harder metals because they wear more slowly and can be more accurately machined.

Shaft diameter, inches.	Horizontal bearings. Min.	Horizontal bearings. Max.	Vertical bearings. Min.	Vertical bearings. Max.
0.375	0.002	0.003	0.001	0.002
1	0.002	0.003	0.001	0.002
2	0.003	0.004	0.002	0.003
3	0.004	0.006	0.003	0.005
4	0.005	0.007	0.004	0.006
6	0.009	0.011	0.005	0.007
8	0.012	0.015	0.006	0.009

The table above gives the clearances commonly used for the bore of bearings.—H. E. W., Chicago, Ill.

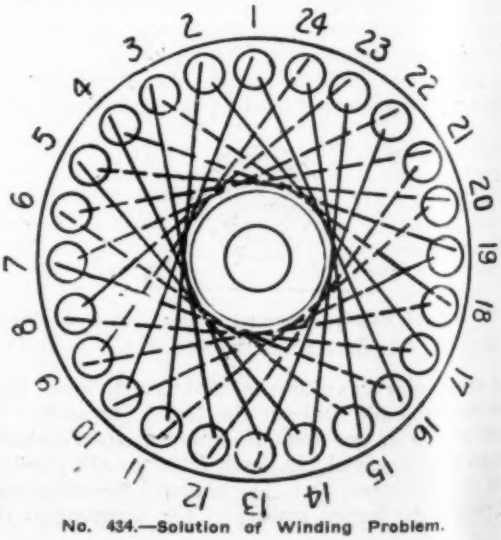
No. 434.—Armature Winding.—I am winding an armature with 24 slots and 72 segments. The accompanying sketch



No. 434.—Problem in Armature Winding.

shows the back of the armature with the first 10 coils in place. There are 3 loops in each coil and 5 coils in series and 10 slots apart. I would like to know just where the rest of the coils are to go. The machine is a 35-volt, 12-ampere generator.—M. B., DeKalb, Ill.

The accompanying sketch shows the armature winding with all the coils in place; the first ten coils as given in the question are shown by solid lines, and the remainder of the coils are shown by dotted lines. A poor system of nomenclature is responsible for most of the difficulty in winding this armature. There are actually 24 coils, each of which contain three single coils with five turns each. The coils should be numbered to correspond with the slots, so that it will be easy to follow the winding. The coils for this armature may be wound on a form, in which case the top half of the first nine coils would not be put in place until all the other coils are assembled. An alternative



No. 434.—Solution of Winding Problem.

method of winding might be used by winding the wire directly into the slots, 3 wires in multiple and 5 turns each; in this case the first 12 coils would all be in the bottom of the slots, and the last 12 all in the top. These coils could be assembled in order numerically or they could be wound, first one to the left of the shaft and then one to the right, thus coil in slot Nos. 1 and 10 followed by the coil in slot Nos. 22 and 13; this gives a well balanced winding from a mechanical point of view. The winding pitch used is rather short; it will be found that winding the coils in slot Nos. 1 and 12 would give the most effective winding, whereas the pitch as given would probably result in some loss due to both ends of the coil being under the influence of the same pole at times.—C. H. H., Swampscott, Mass.

No. 435.—SIGNAL LIGHTS ON SHIPBOARD.—Where the red and green running lights and the foremast light on a ship are electric lights, what arrangement is made to insure that no lamps have been burned out?—T. A. M., Racine, Wis.

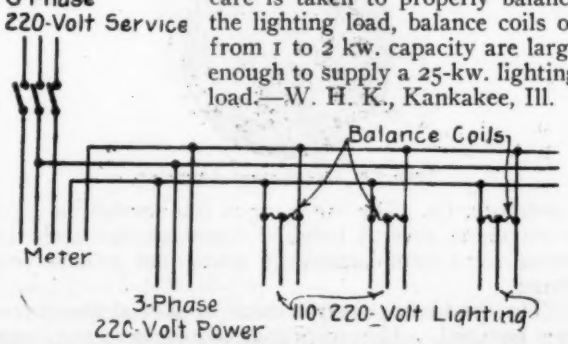
The "running lights" of ships carrying masthead, stern and side electric lamps are indicated as being burning or out by what is known as the "running light telltale board" usually located in the engine room at a point where it is in constant sight. On this board are located other lamps equal in number to those indicated, as well as relays similar in number. The running lights themselves are each connected to their respective relays in such manner that when the light is burning the relay keeps open the circuit that feeds the corresponding telltale lamp. When the running light goes out the relay does not act and the telltale lights. The relays might well be described from considering the action of an ordinary electric bell. In this case, however, the standard bell has been altered so that the magnets thereof do not affect the circuit that goes through the make and break parts; in other words, the bell has been changed to a single-stroke. The make and break parts are used to interrupt the auxiliary circuits. A common terminal, therefore, feeds both circuits, a second goes through the magnets and then to the running light, a third goes through the make and break contacts and then to the telltale. When the current is on the magnets, the make and break contacts are open. As soon as the magnet current is interrupted the armature releases, make and break contacts close, and telltale lights.—W. M. P., Seattle, Wash.

No. 436.—LIGHTING FROM THREE-PHASE SERVICE.—In a large factory plant the lighting and power is now supplied as 60-cycle, three-phase, 220-volt current from the central-station lines, the old factory plant having been shut down. At present the light circuits are supplied through a motor-generator set and are all wired as two-wire 110-volt circuits. The direct-current generator of this set has given some trouble and it is desired to operate the lights direct from the power supply. The inspector of the power company claims that it will be necessary to install three single-phase transformers and divide the lighting load evenly among the phases. This will require much rearrangement of the lighting circuits and to avoid this it is desired to find some way of placing the load on one phase or at most on two phases. The total connected motor load is about 160 horsepower. The lighting load connected amounts to a little above 25 kilowatts. Is there any serious objection to placing all this lighting load on one transformer connected to only one phase? What is the custom of other power companies in handling lighting in factory plants of this kind?—C. L. M., Buffalo, N. Y.

Answer A.—A load of 25 kw. single phase on a three-phase system should not present any serious difficulties, if the station is of large capacity, as most central stations distribute considerable single-phase energy from their three-phase mains, the load being as evenly divided between the three phases as possible. However, should the station be of small capacity and running very near full load, such an addition would present a different aspect as it would be unwise to unbalance the load to such a degree. Should the latter be the case, the writer would suggest dividing the lighting load into three equal sections as nearly as possible and running one phase to each of the these sections. By connecting near to the center of distribution of each section, a fairly well balanced load could be obtained in this way, and this could be supplied by either a three-phase transformer or three single-phase transformers, whichever could be obtained easiest and with least delay. If the station has plenty of capacity, however, and is carrying other single-phase load, it could probably be arranged to connect the 25-kw. load on the phase that is running lightest, if there be one, and any unbalanced condition that might result could be taken care of when new services are connected.—W. T. E., Ansonia, Conn.

Answer B.—The power company with which I am connected has several installations like the one proposed. In one case we have a 10-kv.a. transformer or balance coil connected across one phase of a three-phase, 60-cycle, 220-volt service and it works very satisfactorily supplying the 110/220-volt, three-wire lighting circuits. There are also several other installations of larger capacity on the system, all operating without trouble or complaint. Although the lighting load of each factory is placed on one phase, care is taken to alternate these loads of the different factories on the three phases, thus giving a fairly good balance.—R. O. B., Dixon, Ill.

Answer C.—Central stations generally have a choice of two different rates for customers using single-phase light and three-phase power. The rate submitted depends upon the rules of the company in regard to the capacity served. Where separate rates, and consequently separate meters, are used for single-phase light and three-phase power it is customary to hang a bank of transformers to take care of the three-phase power and hang a separate transformer, connected to one phase of the distribution circuit, to supply the lighting. In a three-phase circuit of ordinary capacity, 100 amperes at the generator, 25 kv.a. connected to one phase will not cause serious unbalance, especially as the unbalancing effect may be neutralized by connecting other customers having single-phase loads to the lightly loaded phases. Where one rate and one three-phase meter is used for three-phase, 220-volt power and single-phase 110-volt lighting it is customary to hang a three-phase, 220-volt bank of transformers of sufficient capacity to take care of the entire load, and then balance the lighting load on three-phase, 110/220-volt circuits connected to the power bus through balancing transformers, as shown in the sketch herewith. The balancing transformers need only be of sufficient capacity to take care of the probable unbalance of one side of the 110/220-volt circuits. If care is taken to properly balance the lighting load, balance coils of from 1 to 2 kw. capacity are large enough to supply a 25-kw. lighting load.—W. H. K., Kankakee, Ill.



No. 436.—Use of Balance Coils for Lighting Circuits From Three-Phase Service.

New Appliances

Current Tap—Wireless Ammeters—Weatherproof Sockets—Water-Tight Marine Fixtures—New Benchboard Designs

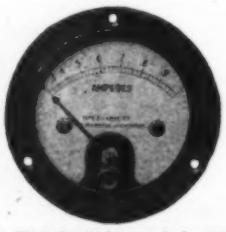
C-H SIDE-OUTLET CURRENT TAPS.

A short time ago the Cutler-Hammer Manufacturing Company of Milwaukee, Wis., placed on the market a new porcelain side outlet "standard" current tap, having an Edison lamp shell and screw base. The side outlet, which is made with both multiple and series connections, has two parallel protected contacts. The arrangement of these contacts and the attaching cap employed conforms to the "standard" for plugs and receptacles adopted by six leading electrical manufacturers who by this move made the "Standard" attaching devices interchangeable. The C-H current tap is furnished either with or without a C-H "Standard" cap. The cap is made of Thermoplax insulation—a heat resisting material, which has ample strength to permit riveting of the contact blades. It has no thin or weak sections—the contact blades remain in permanent alinement and the appearance of the knurled finish is not spoiled by use.

Side-Outlet Current Tap.

METERS FOR WIRELESS AND HIGH-FREQUENCY WORK.

A high-grade hot-wire measuring instrument designed particularly for wireless and other high-frequency work, depending for its operation upon the expansion of a metal strip which is heated by the current to be measured has been developed by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. The slight sag in this conducting strip is magnified several hundred times on the scale by means of a combination of wires and a deflecting spring.



Type EH Switchboard Ammeter.

The conducting strip is made of special non-corrosive material. The separating posts have the same temperature co-efficient of expansion as the conducting strip, so that the changes in room temperature do not cause an error in the reading of the instrument.

The instruments are furnished in two forms, for flush mounting and portable. Similar instruments for switchboard mounting are also supplied.

The flush-mounting form, known as type EH, is of the round open-face type. The face is 3 inches in diameter and the diameter outside the flange is 3¼ inches. It has a black rubberoid case and rim, with white dial.

Type PH Portable Ammeter.

The portable form, known as type PH, is mounted in a morocco-leather-covered wooden case with heavy glass over the dial. The case is 3¾ inches by 4⅛ inches by 2 inches thick.

The scale plate is made of metal and the scale subtends an arc of 90 degrees, being 2⅜ inches long.

The type EH meters have a guaranteed accuracy of 2 per cent, while the type PH, with hand-marked scale, can be expected to show an accuracy within 1 per cent of full scale. Standard meters are for 1, 2 and 5 amperes. Care must be used not to subject the instrument to more than 200 per cent load.

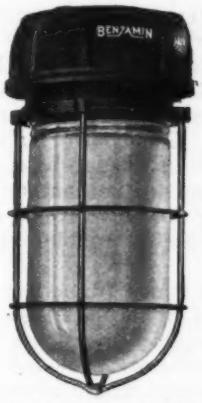
NEW HUBBELL SOCKETS.

The accompanying illustrations show three new types of weatherproof sockets just placed on the market by Harvey Hubbell, Inc., Bridgeport, Conn. Fig. 1 shows a porcelain socket, Fig. 2 a molded mica socket and Fig. 3 a composition socket. Each are rated at 660 watts, 600 volts, and are supplied with 6 inches of No. 14 B & S stranded rubber-covered wire.

Fig. 1.—Porcelain Socket. Fig. 2.—Molded Mica Socket. Fig. 3.—Composition Socket

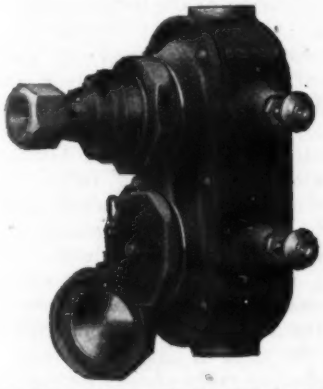
COMPLETE LINE OF BENJAMIN MARINE FIXTURES.

With the development of the shipbuilding industry in America, the Benjamin Electric Manufacturing



Water-Tight Deck Fixture.

Company, Chicago, Ill., began to offer to ship builders a very complete line of marine lighting and signaling apparatus, most of it being water-tight and designed and made strictly for use under severe conditions aboard ship.



Two-Gang Water-Tight Outlet Box.

Some typical devices being produced by this company include water-tight boxes, for use with various types of receptacles, switches and connecting blocks and fixtures.

Also there is a line of water-tight marine lighting

Three-Wire Plug Receptacle.

Double-Pole Switch.

fixtures, both in deck and bulkhead installation. Some of the interior parts of these have features of special interest. In addition to this the Benjamin Company is furnishing the merchant marine and navy with signaling apparatus, consisting of buzzers, bells and buttons, all of water-tight construction. The Benjamin Company's wide experience in manufacturing light-

Connecting Block.

ing and signaling apparatus for oil refineries and flour mills qualifies it for the extraordinary demands for marine devices at this period. The Benjamin marine line is built up around certain basic parts in order to provide the uttermost interchangeability. Boxes, covers, globes and rings are standardized, and the spacings for supporting screws on receptacles and switches

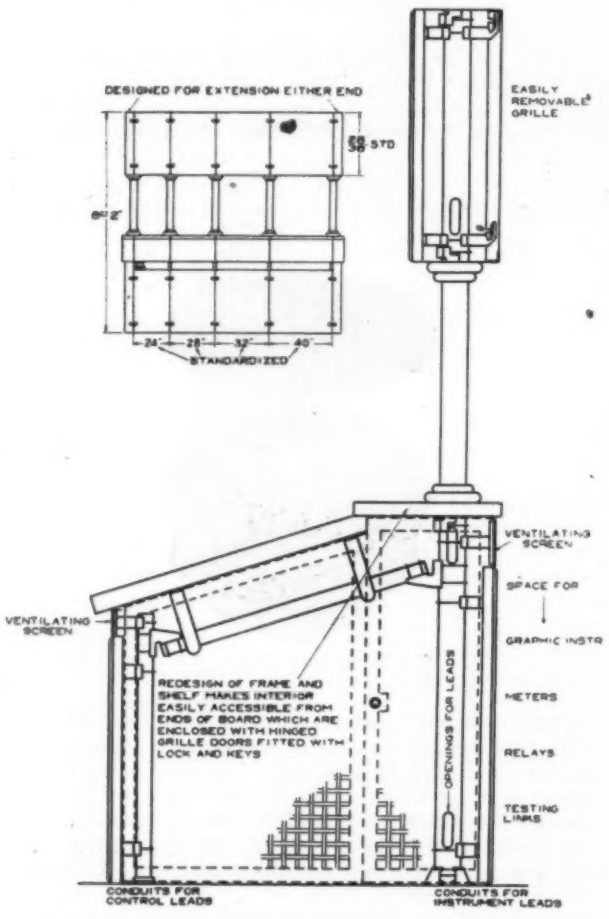
Water-Tight Bell.

are in accordance with recognized practice and standard spacing of mounting bosses on various junction boxes and fixture bodies.

The Benjamin reputation for making quality things has done it all as a part of the national effort to speed up shipbuilding.

IMPROVEMENTS IN BENCHBOARD DESIGN.

In connection with the manufacture of switchboard equipments by the General Electric Company, Schenectady, N. Y., for some of the large power plants during the last few years, various improvements in benchboards have occurred to the designing engineers, or have been suggested by purchasers. It was, therefore, decided to redesign the several types of benchboards already on the market, to incorporate these improvements and at the same time to standardize, as far as possible, the design so that a fewer number of parts are required, or that common parts can be used for different types of benchboards. This will enable the



Cross Section and Front Elevation of Open Benchboard.

factory to take the benchboard material from a not too cumbersome stock, and shortens the time of delivery, as long as the purchaser confines himself to standard design.

Designs have been completed now, and the following types of benchboard of new design are standard.

(1) Open-type of board (see illustration).

(2) Closed-type board, with back panels in two or three sections.

(3) Closed-type board, without back panels, installed near wall.

(4) Control bench, for installing in front of instrument and meter panels.

The standardized width of sections for all types of benchboard are 24, 28, 32 and 40 inches. All types of board are designed so as to make future extension possible at either end; in fact, with this design a benchboard can be extended as easily as a vertical board.

The grille panels back of the instrument sections are easily removable without the use of wrench or screwdriver. Instead of grille work back of the bench, panels are used which provide a convenient place for mounting graphic instruments, meters, relays, testing links, etc. This enables the purchaser to test these devices without interfering with the operator in front of the bench. Furthermore, with this arrangement of apparatus, all instrument leads can be brought up from the floor in almost a straight line to the instrument section without passing under the control bench, which is usually crowded. The control leads can then be distributed neatly back of the sub-base, where they leave the conduits, and up to the control apparatus. This condition of wiring not only gives a neat arrangement of wiring, but, in case of trouble, the whole system is exposed at once.

Redesign of the bench frame and increasing somewhat of dimensions of the bench structure makes the interior easily accessible from the ends of the bench.

Ventilating screens are provided on the front and back, running the entire length of the bench, thus preventing excessive heating from lamps and resistances. Further improvements include the use of welded instead of pivoted joints, which makes a better job and also gives a more pleasing appearance.

OREGON LUMBER MILL ELECTRIFIES.

The electrification of the lumber mills of the Booth-Kelly Lumber Company, at Springfield, Ore., completed about five years ago, received special attention from electrical men at that time as it was considered typical of the progress then being made in adapting electric drive to the lumber industry.

It is of interest to refer to the Springfield mills in connection with the following facts relative to that company's recently equipped sawmill and planing mill at Wendling, Ore. In this new plant General Electric equipment was installed throughout. This consisted of a 750-kv.a. turbogenerator, and 1000 horsepower in alternating-current motors. The motors are all of constant speed, the necessary variation being accomplished by changing the sizes of driving pulleys. In this mill, as in other planing mills of this section, the plan is to connect the planing machine driving shaft directly with a constant-speed, squirrel-cage motor.

A 50-horsepower motor, operating at 1200 revolutions and 2200 volts, drives a combined matcher and re-saw. In this case the motor is mounted upon the top of the re-saw frame and silent-chain transmission is used. The sizer re-saw is driven by a 50-horsepower motor, at 900 revolutions and 2200 volts. A matcher and profile cutter are operated by a 50-horsepower motor, running at 1200 revolutions and 220 volts, and a motor of 15 horsepower at 1800 revolutions and 440 volts, the two motors being belted to different parts. The sizer is driven by a 75-horsepower motor, slip-ring type, running at 900 revolutions and 2200 volts; the band ripsaw requires a motor of 20 horsepower, at 1800 revolutions, 440 volts. A trim saw and miscellaneous transfer drives are operated by 440-volt motors at speeds of 1200 to 1800 revolutions, and ranging from 2 to 5 horsepower. Two centrifugal fans, driven by 2200-volt motors, running at speeds of 720 and 1800 revolutions, handle the mill refuse. These are double fans—one side taking up refuse and the other side blowing it out through a pipe to the fuel bin. R. G. Littler, of West Coast Engineering Company, Portland, supervised the installation of the equipment.

Current News

Weekly Record of Construction Activities—Conventions

EASTERN STATES.

CENTRAL FALLS, R. I.—The Bryan-Marsh Electric Works of the General Electric Company, 521 Mill street, has awarded a contract for alterations and improvements in its plants, to cost approximately $60,000. The J. Bishop Company, Providence, is the contractor.

HARTFORD, CONN.—The Connecticut Company, 115 State street, has awarded a contract to C. A. Sibley, 902 Chapel street, New Haven, for the erection of a new two-story addition to its boiler plant, to provide for increased operations.

BROOKLYN, N. Y.—The United States Government, Bureau of Yards & Docks, has awarded a contract for the installation of the proposed new heating system at the local navy yards, to cost $62,960. The Enterprise Steam & Hot Water Heating Company, 600 North Howard street, Baltimore, Md., is the contractor.

BUFFALO, N. Y.—The New York Central Railroad Company has commenced work on improvements in its signal system on the belt line. A new automatic signal system will be installed from East Buffalo to Black Rock.

FULTON, N. Y.—In connection with the extensive additions to be erected at the plant of the Fulton Steel Company, near Division street, to cost in the neighborhood of $100,000, a large new electric furnace will be installed.

JAMESTOWN, N. Y.—On September 11 bids will be received for conduit, wiring and lighting fixtures for the United States office at Jamestown, N. Y. Address James A. Wetmore, Supervising Architect, Washington, D. C.

NEW YORK, N. Y.—The Western Electric Company, Inc., has leased property at 400 West Fourteenth street, covering a floor area of 10,000 square feet, for extensions.

NEW YORK, N. Y.—The Goodyear Rubber Insulating Company, 105 East One Hundred and Thirty-first street has had plans prepared for the erection of a new two-story extension to its plant, to cost about $9,000. Frederick S. Minott is president.

SYRACUSE, N. Y.—At a recent meeting of stockholders of Allen-Peck, Inc., Vinney Building, operating various public utilities corporations, it was voted to change the corporate name of the concern to Peck-Shanahan-Cherry, Inc.

WATERVLIET, N. Y.—The Adirondack Electric Power Corporation has broken ground on the construction of a new one-story addition to its electric substation, about 20 by 40 feet.

DOVER, N. J.—The McKiernan-Terry Drill Company, manufacturer of shells for the gun division of the War Department, is planning to increase the capacity of its plant, and will add to their present installation of motors. About 45 additional horsepower will be installed.

NEWARK, N. J.—The Newark Wire Cloth Company, 224 Verona avenue, has had plans prepared for the construction of a new extension to its power house on Mt. Prospect avenue, to cost $4,000. A building permit for the structure has been taken out.

DOVER, N. J.—The New Jersey Power & Light Company has been granted permission by the Board of Public Utility Commissioners to issue $81,000 first mortgage five per cent gold bonds. The company has commenced the installation of three new 500 kva. transformers at its plant to provide for increased capacity.

GLOUCESTER, N. J.—The New Jersey Public Utility Commission has approved the application of the Emergency Fleet Railway Company to lease a trolley line to the Public Service Railway Company. The line is to be constructed between Newton Creek, in Camden county, to Gloucester, at a cost of approximately $220,000. The line is authorized in order to provide transportation facilities for workers in the yards of the New York Shipbuilding Company in Camden and the Pusey & Jones Company, Gloucester.

HIGHTSTOWN, N. J.—The Electric Light & Power Company has been granted permission by the Board of Public Utility Commissioners to increase its rates for service by adding a war surcharge of one-half cent per kilowatt-hour for metered commercial light and power.

KEARNY, N. J.—Work is well under way at the new glue factory and power plant being erected by Swift & Company, 154 Ninth street, Jersey City, at its local works. The entire new plant is estimated to cost $85,000. The Ruggles-Robinson Company, 331 Madison avenue, New York, is the contractor.

KENVIL, N. J.—The Hercules Powder Company has recently completed the construction of a new electrically-operated pumping station at its plant, electric energy for operation has been contracted for with the New Jersey Power & Light Company.

NEWARK, N. J.—The Public Service Corporation is now consuming about 100,000 tons of coal monthly at its various operating plants throughout the state. With a total generating capacity of about 100,000 kilowatts, approximately 90 per cent of this electric power is now being used by local industrial plants operating on war contracts for the Government. Following the adoption of a bituminous coal storage schedule by the United States Fuel Administration, allowing only a thirty-day supply of coal in storage, the company has pointed out that if this rule is enforced it will result in a serious curtailment of the power now being supplied to important industries. The company for the last few months has been able to maintain a storage supply from 30 to 60 days' consumption. This reduction in storage would also affect the Public Service Railway Company and the Public Service Gas Company, subsidiary organizations.

NEWARK, N. J.—Contracts have been awarded by the Board of Education for alterations and improvements in the boiler plants at the following public schools: Warren Street School, at $5,100; Girls' Vocational School, $1,842; Hawthorne Avenue School, $1,350; Lawrence Street School, $1,745; Summer Place School, $1,633.

PAULSBORO, N. J.—Electric motors and other electrical machinery will be installed in the new shipbuilding plant to be erected on a local site by the Fort Mifflin Shipbuilding Company, Widener Building, Philadelphia, Pa. The plant is estimated to cost $1,000,000, and the initial works will consist of heavy plate shop, light plate shop, joiner shop, machine shop, forge works, miscellaneous iron works, and other structures. All of these buildings will have the latest type machinery and wherever possible individual motor drive. Leonard B. Harris, Flushing, L. I., is engineer for the company.

POMPTON LAKES, N. J.—The Borough Council has awarded a contract to Frederick Kilgus, 13 South Sixth street, Newark, for the construction of the proposed new two-story brick addition to the municipal hydroelectric plant, about 40x67 feet. The structure will cost about $25,000.

ROCKAWAY, N. J.—Following recent improvements in its electric power plant at its Mt. Hope mining properties, the Empire Steel & Iron Company, has again found it necessary to close the works temporarily to make further extensions and improvements in the plant, as well as in electric equipment used in the operation of the mines. It is understood that the capacity of the iron ore properties will be increased, necessitating additional power. The company expects to give employment to about 300 hands, or practically double the present number.

TRENTON, N. J.—The Board of Managers of the Trenton School for the Deaf is planning for the early installation of new motors at the institution.

TRENTON, N. J.—In connection with the appropriation of $200,000,000 asked for by the War Trade Board for the construction and improvement of power plants in various sections, it is said that a total allotment of $5,500,000 is planned for the New Jersey districts.

TRENTON, N. J.—The William R. Throop & Sons Company, East State street, has submitted the low bid to the

Board of Freeholders for the installation of electric motors for the operation of the drawbridges on Southard street and Olden avenue, at $3,992 and $3,885, respectively.

ALLENPORT, PA.—A new power house will be erected by the Pittsburgh Steel Products Company, Pittsburgh, in connection with other structures being constructed at its local works. Contract has been awarded to the Wilson Construction Company, Fulton Building, Pittsburgh.

EVERETT, PA.—The Chapman's Run Mutual Telephone Company is planning for the construction of a new line in the vicinity of Everett. The Bedford-Fulton Telephone Company is now operating in this territory, and in an application to the Public Service Commission holds that the Chapman's Run company will parallel its lines by the proposed construction.

HARRISBURG, PA.—The Harrisburg Light & Power Company is making extensive improvements in its plant on Cedar Street, to provide for increased operations.

HAZLETON, PA.—The Lehigh Navigation Electric Company is supplying additional power to the plant of the Bethlehem Steel Works, Bethlehem, which is engaged on Government contract work.

HOOVERSVILLE, PA.—The Public Service Commission has granted approval to the application of the Borough of Hooversville to take over and operate the plant and system of the United Light, Heat & Power Company.

PHILADELPHIA, PA.—The United States Government, Bureau of Yards & Docks, has awarded a contract for the erection of the proposed new submarine battery building at the local navy yards, at a cost of $129,750. The Turner Concrete Steel Company, Philadelphia, is the contractor.

PHILADELPHIA, PA.—In connection with the emergency hospital buildings to be erected by the United States Government, Bureau of Yards and Docks, on Grays Ferry Road, to cost about $355,000, plans have been prepared for the construction of a two-story boiler plant, about 48 by 67 feet.

PHILADELPHIA, PA.—Mark D. Ring & Sons Company, Sixty-ninth street and Haverford avenue, has awarded a contract for the erection of a new one-story brick addition to its engine plant, about 20 by 40 feet. The Hughes-Foulkrod Company, Commonwealth Building, is the contractor.

PHILADELPHIA, PA.—The United Electric Construction Company, 1727 Sansom street, has taken title to property at 1729-31 Sansom street, including a four-story brick structure, three-story brick shop, with three-story extension.

PHILADELPHIA, PA.—S. H. French & Company, Lawrence and Callowhill streets, have had plans prepared for the installation of new boilers at their plant.

PHILADELPHIA, PA.—The Pennsylvania Railroad Company has had plans prepared for the installation of new refrigerating apparatus at its Broad Street station.

PITTSBURGH, PA.—The proposed new generating plant to be constructed by the West Penn Power Company in the Allegheny Valley at a cost of about $5,000,000, will have an initial capacity of 40,000 kilowatts divided into two 20,000 kw. turbogenerators with auxiliary equipment. The plant will be tied in with the other generating stations of the company with the addition of a new transmission system throughout the Connellsville district. The boiler and stoker equipment will be designed for utilizing bituminous coal. The new plant will be operated in co-operation with the Ordnance Department, which will advance $2,000,000 towards the cost of construction, the remainder being appropriated by the company. The electric energy to be generated will be used for the most part by munition and other industrial works in and around the Pittsburgh district. It is understood that considerable of the new equipment for the plant will be furnished by the Westinghouse Electric & Manufacturing Company. J. B. Finley is an official of the company.

PITTSBURGH, PA.—In connection with the construction of the large new ordnance plant of the Government on Neville Island, plans have been prepared for the erection of a large new generating plant to cost, it is said, in the neighborhood of $5,000,000. Contract has been awarded to the Westinghouse Electric & Manufacturing for three new 15,000-kilowatt generators for the proposed plant, which will be located on an island adjacent to the ordnance works.

READING, PA.—The Metropolitan Edison Company has filed notice with the Public Service Commission of a bond issue for $486,500, the proceeds to be used, in part, for extensions and improvements.

BALTIMORE, MD.—The Consolidated Gas, Electric Light & Power Company, Lexington Street Building, is considering further extensions to its steam operated electric power plant at Westport. Following the installation of two 55,000-horsepower turbo-units, it is proposed to duplicate this equipment with units of like capacity, making a total of 110,000-horsepower capacity for the plant. The new work is estimated to cost approximately $4,000,000.

WASHINGTON, D. C.—The Potomac Electric Power Company is planning for the early installation of a new 15,000 kw. turbogenerator in its plant in connection with other proposed improvements. The company has issued bonds for $2,100,000, a portion of the proceeds to be used for the proposed work. L. E. Sinclair is general superintendent.

RICHMOND, VA.—In connection with the new plant to be erected by the Virginia Baking Company, contract has been awarded for the erection of a boiler plant at the works, about 40 by 75 feet. The entire new plant is estimated to cost $150,000.

RICHMOND, VA.—The Council will expend $12,000 in purchasing electrical apparatus to furnish electricity to the boiler-plate plant, operated by the Government.

FAIRMONT, W. VA.—The Monagahe Valley Traction Company will issue $2,500,000 in bonds to complete work underway to build gas plant and later gas mains and to extend transmission lines to coal mines. Address general manager, Watson building.

HARTLAND, W. VA.—In connection with a number of extensions being made in its transmission system, the Hartland Power Company, operated by W. S. Barstow & Company, New York, is rushing to completion a new transmission line to Beechy Creek for the purpose of supplying power for the operation of the properties of the Elkland Mining Company. The company is considering plans for the extension of this the Elkhurst Coal Mining Company, the big Block Coal Company, the Foy Splint new line to Dorfee to supply power to Company, and the Thompson Block Coal Company.

HUTCHINSON, W. VA.—The Monongahela Valley Traction Company will build an addition to its electric power plant.

SOUTHPORT, N. C.—The Southport Electric Light & Power Company has incorporated with a capital of $30,000. Address Wm. W. Bellamay of Wilmington, N. C.

TARBORO, N. C.—City officials are planning to issue bonds for $50,000 to provide for improvements and extensions in the municipal electric light and power plant. J. H. Jacocks is city clerk.

LABELLE, FLA.—C. W. Shaefer of Cleveland, Ohio, will build an electric light plant at this place.

PENSACOLA, FLA.—The United States Government is planning for the installation of a new electric-lighting system in connection with the townsite development near Bayou Grande.

DATES AHEAD.

Association of Iron and Steel Electrical Engineers. Annual convention, Southern Hotel, Baltimore, Md., September 9-14. Secretary, John F. Kelly, McKeesport, Pa.

Northwest Electric Light and Power Association; affiliated with N. E. L. A. Annual convention, September 11, 1918. Secretary, George L. Myers, Pacific Power & Light Company, Portland, Ore.

Michigan Section, N. E. L. A. Annual convention, Pantlind Hotel, Grand Rapids, Mich., September 17 and 18. Secretary-treasurer, Herbert Silvester, Monroe, Mich.

International Association of Municipal Electricians. Annual convention, Atlanta, Ga., September 24-27. Clarence R. George, Houston, Tex.

New England Section of the National Electric Light Association, Annual meeting, Hotel Kimball, Springfield, Mass., September 27 and 28. Secretary, Miss O. A. Bursiel, Boston, Mass.

American Electrochemical Society. Fall meeting, Princeton, N. J. Secretary, Prof. J. W. Richards, Lehigh University, Bethlehem, Pa.

American Electric Railway Association. Annual meeting, Atlantic City, N. J., October 8 and 9. Secretary, E. B. Burritt, 8 West 40th street, New York City.

Illuminating Engineering Society. Annual convention, New York City, October 10. General secretary, Clarence L. Law, Irving place and 15th street, New York, N. Y.

Jovian Order. Annual convention, Dallas, Texas, October 24-25-26. Mercury, Ell C. Bennett, 1415 Syndicate Trust building, St. Louis, Mo.

Kansas Public Service Association. Annual meeting, Kansas City, Kans., October 17-19. Secretary-treasurer, W. W. Austin, Cottonwood Falls, Kans.

NORTH CENTRAL STATES.

SPRINGFIELD, ILL.—The State public utilities commission has issued an order authorizing the following companies, forming a portion of the Illinois traction system to issue bonds: St. Louis, Springfield & Peoria Railway, $167,000 of first and general mortgage gold 5 per cent bonds; Decatur Light & Railway Company, $50,000 of consolidated and refunding 5 per cent debenture bonds, and Urbana & Champaign Railway, Gas & Electric Company, to issue $25,000 of similar bonds.

SAVANNAH, O.—In connection with the recent primaries the electors of the village voted on the proposition to issue $10,000 of 6 per cent bonds for the purpose of erecting and equipping an electric light plant for Savannah. There were only 7 votes cast against the electric light plant proposition. The plant will take the place of the electric light plant destroyed in the big conflagration in the village April 2 last.

SADORUS, ILL.—Bonds have been voted to secure municipal lighting. The council has not decided whether to build plant or to secure electricity by transmission. Address city clerk.

CHILLICOTHE, MO.—A contract has been closed by the local agent for the Delco Lighting Plant Company with J. M. Decker at Dawn, Mo., for the installation of a Delco automatic light plant for the town.

CLARENCE, MO.—J. A. Bilbre has bought the electric light and water plant at Puxico, Mo.

NOVINGER, MO.—The Merchants' Light & Power Company will rebuild plant recently destroyed by fire.

SALEM, MO.—The electric light plant was seriously damaged in a recent storm. Lightning struck the wires and burned out the coils to such an extent that service has been suspended.

SPRINGFIELD, MO.—In connection with the proposed new power plant of the Springfield Gas & Electric Company, plans for which are now in course of preparation, it is understood that a new 10,000-horsepower steam turbine will be installed with auxiliary apparatus. Sanderson & Porter, 52 William street, New York, are engineers for the company.

FRANKFORT, KANS.—The Frankfort Light & Power Company has received 20,000 pounds of copper wire for a line to large water-power plant at Blue Rapids. The present plant at Frankfort will be maintained as it is at present, in order to provide against an emergency.

SOUTH CENTRAL STATES.

FLORENCE, ALA.—The local and long distance telephone lines in Florence, Sheffield and Tuscumbia are to be built new, from the ground up, and material for this task of changing an antiquated to the most improved of telephone systems already is being collected here in large quantities. F. L. Woodruff of Atlanta, southern manager, is in charge of the work.

GORGAS, ALA.—Announcement has been made that the new steam power plant now in course of construction by the Government on the Warrior River will be ready for operation some time in the early part of October. The plant has been designed to furnish power to the Government nitrate plant at Sheffield. In connection with the work, a new transmission line has been constructed from Gorgas to Sheffield, a distance of about 88 miles.

MOBILE, ALA.—The Mobile Light & Railway Company has petitioned for franchise to extend railway to the ship yards. Address J. C. Wilson, president.

ASHDOWN, ARK.—The Consolidated Public Service Company will purchase additional electrical equipment.

MENA, ARK.—The city council has passed an ordinance granting the Commonwealth Service Company a 21-year franchise to operate an electric light and power plant in Mena. The company plans to rebuild the plant at a cost of $25,000.

SPARKMAN, ARK.—The Sparkman electric light plant owned by Edward Hearn, was destroyed by fire August 14.

NEW ORLEANS, LA.—The New Orleans Railway & Light Company will arrange with the New Orleans Belt Railway Company to operate street cars on the belt road tracks. Extensions and improvements will be necessary, estimated to cost $200,000.

DRUMRIGHT, OKLA.—The Pipe Line Company, controlled by the Sinclair Oil & Refinery Company, of Tulsa, will build 275 miles of oil pipe line from Drumright to Freeman, Mo.

MIAMI, OKLA.—The Pioneer Telephone Company will remodel its exchange and install new equipment at a cost of about $10,000.

EL PASO, TEX.—The Rio Grande Valley Traction Company has increased its capital from $300,000 to $500,000. Extensive improvements will be made. C. W. Kellogg, manager, El Paso.

RANGER, TEX.—An electric light plant will be established here. Address secretary of Chamber of Commerce.

SOMERVILLE, TEX.—The Gulf, Colorado & Santa Fe Railway will build an electrical power house. Address Frank G. Pettibone, general manager, Galveston, Tex.

WESTERN STATES.

OLYMPIA, WASH.—The State Board of Control rejected all bids for construction of a new power and heating plant at the school for girls at Grand Mound, Washington, the lowest bid being for $16,735, or $8,000 more than the appropriation available.

TACOMA, WASH.—Commissioner Gronen of the light and water department has been authorized to purchase a 1000-kilowatt generator set for use in his department at a cost of $13,500.

FRESNO, CAL.—The California Associated Raisin Company is considering plans for the early construction of a new power plant, about 85 by 155 feet, at its works at Sun Maid City, to provide for increased operations.

FRESNO, CAL.—The San Joaquin Light & Power Company has recently acquired property at California Street and Orange avenue, comprising approximately 5 acres, as a site for the erection of a large new power plant, to be used for furnishing power for the operation of the raisin and peach plants in the vicinity of Fresno. The company is making rapid progress on the construction of the initial unit of the proposed new power project on the Kings River, the new plant to develop approximately 100,000 kilowatts, and being located near Madera. The company has also been granted permission by the State Railroad Commission to operate in Kern County under franchise approved by the county officials.

LOS ANGELES, CAL.—In connection with extensive improvements and extensions to be made by the Southern California Edison Company, plans have been prepared for the construction of a large new dam at its Pitman Creek reservoir. The estimated cost of the dam and conduit line to its Big Basin Reservoir is placed at about $800,000. The company is also considering plans for the construction of two new power plants on Big Creek, to be known as Plants Nos. 3 and 4.

LOS ANGELES, CAL.—The Department of Public Service is planning for the construction of a large new electric power plant, and has made application to the State Water Commission for permission to divert 120 cubic feet per second with a storage of 24,227 acre feet per year, of the waters of the South Fork Kern River in Tulare county.

NEWPORT BEACH, CAL.—In connection with the proposed irrigation project by the Newport Mesa district, plans are being prepared for the installation of a pumping plant.

OROVILLE, CAL.—The Pacific Gas & Electric Company is considering plans for increasing the capacity of its local hydro-electric plant. John A. Britton is vice-president.

PASADENA, CAL.—The Board of Education has had plans prepared for extensions in the boiler plant at the local high school building at Colorado Street and Sierra Bonita Avenue.

REDDING, CAL.—Construction has been commenced by the Northern California Power Company on the proposed new power line to connect its power plant at Coleman with the system of the Pacific Gas & Electric Company, Capay. The new line is estimated to cost about $125,000, and it is expected to complete the work before the end of October.

SAN JACINTO, CAL.—The Southwestern Home Telephone Company has had plans prepared for the construction of a new one-story building in Main Street, about 25 by 40 feet.

SEATTLE, WASH.—Favorable action has been taken by the finance committee of the Seattle city council, instructing City Engineer A. H. Dimock to proceed with the survey of the Skagit River power project with a view to the immediate beginning of construction work. The first issue of bonds totaling $1,500,000 will be available November 15, and in the meantime it is expected that the necessary funds for the preliminary work will be secured by borrowing from the general fund.

VAL VERDE, CAL.—In connection with a bond issue for $135,000 recently authorized for the construction of a new local irrigation works, the proposed plant will include pumping stations with necessary apparatus. It is understood that the stations will be electrically operated.

Trade Activities

New Catalogs Issued by Manufacturers—Trumbull Company Discontinues Cable Manufacture—Other Items

Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has sold to the North Portland Box Company, Portland, Ore., for the construction and equipment of a tub factory in the Peninsula district, the electrical equipment for a 400-kilowatt plant, which includes three 125-kilowatt transformers, and about 400-horsepower in motors, for operating woodworking machines. Central-station power will be used.

Jeffrey-Dewitt Insulator Company, Huntington, W. Va., is distributing catalog No. 2, which contains a fund of information for users of high-tension disk insulators. A number of illustrations are shown of J-D insulators on high-frequency test and also of prominent installations. There are numerous detail drawings of accessory hardware and parts and considerable useful data on specifications and operation.

Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has just published a descriptive booklet entitled, "Magnet-Operated Brakes for Direct-Current Service." The front cover illustration shows a typical application of this brake installed on a V-grove traction-type passenger elevator. The booklet makes mention of the many desirable operating features that have been secured by recent improvements in design, and points out that by lowering the position of the magnet and making the magnet armature an integral part of one of the arms carrying the brake shoes, the construction has been simplified, fewer parts are required, compactness is secured, and the parts made extremely strong and rugged without adding excessive weight. The new design makes these brakes especially applicable for use on a crane, hoist, or bridge. Ratings, dimensions, engineering data and the formula for determining the retarding torque required for any brake installation are given. The booklet lists the standard sizes which vary from 8 to 30 inches in diameter and from 15 to 300 h. p. capacity.

Benjamin Electric Manufacturing Company, Chicago, Ill., has ready for distribution an attractive catalog devoted to its marine lighting and signalling apparatus which are in general use in the shipbuilding industry. The catalog is divided into four sections dealing respectively with marine fittings such as water-tight junction boxes, connecting blocks, receptacles, switches and attachment plugs, marine lighting fixtures, parts for Benjamin marine devices and signaling apparatus. The latter section includes water-tight buzzers, bells, gongs, horns and push buttons. All Benjamin marine fittings are mounted on bases of high heat-molded insulating. One of the important features of this company's products is the standardization of parts to the highest point in order that the utmost interchangeability may be possible. Junction boxes may be installed and the receptacles, connecting blocks, or switches, and covers may be mounted later, as the location require. The same applies to fixtures, all parts being interchangeable. This feature is unanimously urged by shipbuilding engineers. The fittings illustrated and described in the Benjamin catalog comprise a complete line which meet all ordinary requirements.

Charles C. Moore & Company with head offices at San Francisco, report numerous installations by the Seattle branch. The company is adding a 1,000-kilowatt turbogenerator to the sawmill of the Wheeler-Osgood Company at Tacoma, Washington. A 300-horsepower boiler is being installed at the Northern Hospital for the Insane at Sedro Woolley, Washington. Installation of a 500-horsepower boiler plant has been completed for the Vancouver General Hospital at Vancouver, B. C., consisting of Babcock & Wilcox boilers and chain-grate stokers; a power plant for the Whalen Pulp & Paper Mills at Port Alice, B. C., which includes 2,500 horsepower Babcock & Wilcox boilers. Company is furnishing the boiler equipment for the 750,000-foot capacity spruce mill which is being erected at Port Angeles, Washington, by the Siems, Carey H. S. Kerbaugh Corporation of Minneapolis. A 600-horsepower Babcock & Wilcox boiler has been installed at the Western avenue plant of the Puget Sound Traction Light & Power Company, Seattle, and two 500-horsepower Stirling boilers at the Georgetown plant of that company. The company has work well under way on the first unit of the 30,000-kilowatt steam plant of the Northwestern Electric Company at Portland. Two 500-horsepower Stirling boilers are being installed for the Wheeler-Osgood Company at Tacoma and two 300-horsepower Stirling boilers for the Pacific Coast Condensed Milk Company at Nampa, Idaho.

P. F. Apfel, president of the Electric Sales Corporation, Henry building, Seattle, recently made a trip to Toronto, Canada, where he established a factory for the manufacture of Apfel's System of Electric Heating. While in Canada he disposed of his patent for that country. The Salisbury Electric Company, Ltd., has control of the new company, the two factories to work together in the production of standardized Apfel Electric Heating Devices. The two plants are working to capacity. At Seattle, the Electric Sales Corporation recently installed Apfel's Multiple Unit Water Heaters in the Hollywood Apartments, Bain Apartments and the Sunset Club. These installations replaced gas and garbage burners.

Edison Electric Appliance Company, through its GE division, Chicago, Ill., has recently issued a bulletin illustrating and describing its line of electric heating and cooking appliances. The bulletin contains considerable interesting information regarding this company's products and is well illustrated with reproductions of the various appliances. The accompanying text deals with conservation resulting from the use of household devices.

The Trumbull Electric Manufacturing Company, Plainville, Conn., states that it is permanently discontinuing the manufacture of armored cable, armored cord and a flexible steel conduit, schedules "X" and "Y." This step was taken so that it could devote its entire energy to other lines, including a large amount of government business direct and indirect, as well as the externally operated line of kife switches. The company, therefore, has found it necessary to cancel all orders for armored cable, armored cord and flexible-steel conduit in the works, and no further orders can be taken.

The Mica Insulator Company, 68 Church Street, New York, with works at Schenectady, N. Y., has issued a bulletin entitled "The Insulation of Commutators," containing facts relative to this subject and a discussion of insulation in general. Early methods of insulation are also discussed, and a resume of the invention of "Micanite" is given. Mica films, cement content of micanite and the different kinds of mica plate are also treated of. The characteristics of "micanite," including its uniform thickness and density, high specific weight, extremely low compressibility, very small cement content and large area of individual mica films, are also outlined.

Vulcan Fuel Economy Company, Chicago, in the August issue of its house organ, Vulcan's Forge, tells of the use of more than 100 Vulcan soot cleaners by the Chicago & Northwestern Railroad, Stone & Webster and the H. M. Byllesby Company. The H. L. Doherty Company, who had twenty-five Vulcans in use, recently ordered one hundred more. Of this company's boiler-setting coating, Vulcan-Lastite, the Vulcan's Forge discusses the requirements of a boiler-setting sealing compound, laying emphasis upon the vital importance of elasticity, ease of application and earning capacity. Plastic coatings vary widely in cost, but it is not initial cost that determines the most durable and cheapest compound. It is its life, its efficiency, that determine which coating proves the best investment spread over a period of time. An interesting story of a boiler room where it was possible to double the percentage of CO_2 within half an hour by the use of a Vulcan draft gauge and a Vulcan-Orsat is also told in the August issue.

Recent Patents

Selected and Summarized by Albert Scheible, Patent Attorney, 79 West Monroe Street, Chicago, Illinois

Preparing Vacuum Tubes (1,272,374).—Before completing the exhausting of a vacuum tube containing a heated cathode, an anode and an auxiliary electrode, Oliver E. Buckley (of East Orange, N. J.) maintains an electron discharge between the cathode and anode. Then he also applies such a voltage between the auxiliary electrode and the cathode as to limit the current to a given value while permitting a large voltage between the anode and cathode so that the energy of the electrons striking the anode shall be large. (Patent assigned to the Western Electric Co.)

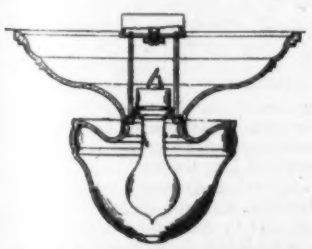
Slow Acting Circuit Controller (1,272,446).—The sectionalizing device patented by Harry M. Jacobs of Schenectady, N. Y., includes an electromagnetic device for moving a controller to its closed position, and slow-acting means set in operation by such a movement of the controller for de-energizing the electromagnetic device. (Patent assigned to the Union Switch & Signal Co.)

Electrically Heated Clothes Presser (1,272,638).—An electric heating element is used in combination with a steam chamber in the clothes presser patented by James A. Du Laney, of Seattle, Wash.

Multi-Filament Lamp (1,273,130).—An incandescent lamp in which each one of a number of filaments or filament positions takes its turn at being heated to luminescence and at partly cooling off is shown in this patent to William L. Barnard of St. Louis. He provides separate leading-in wires for the filament terminals, through which wires the connections are continuously changed by a commutating device.

Telautographic Apparatus (1,272,874).—Tracer and signal circuits are included in the telautographic system of George S. Tiffany (of Summit, N. J.) according to this patent, issued on an application filed in 1912.

Lighting Fixture (1,273,408).—Both the socket and the bowl-holder are supported at the mouth of the canopy,



No. 1,273,408.—Lighting Fixture.

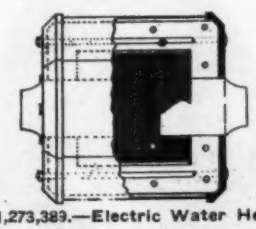
according to this patent, assigned by Milton B. Roller to the Thomas Day Co. of San Francisco.

A series of brief comments on some of the recently issued electrical patents which appear to be of particular interest to our readers, the number after each heading being that of the United States patent to which the summary relates. Any correspondence regarding such patent matters should be sent direct to Mr. Scheible at the above address.

Combined Sound Reproducer and Lighting Fixture (1,272,843). — A sound reproducing device and a sound amplifier both form parts of the indirect lighting fixture devised by Herman G. Pape of New York City, so that the same reflector which directs the light against the ceiling also aids in diffusing the sound.

Telephone System (1,273,189).—In connection with a pair of connected lines., Fred Schoenwolf (of Chicago) provides means controlled at the substation of either of the two lines for interrupting the application of the ringing current. The patent stands assigned to the Kellog Switchboard & Supply Co.

Electric Water Heater (1,273,389).—The core of a magnet coil used on alternating current constitutes the sole heating unit, the magnetic return circuit being of less magnetic



No. 1,273,389.—Electric Water Heater.

resistance than the core, so that the heating is localized in the walls of a duct extending through the core. (Patent assigned by Wayne D. Ludwick to the Electric Heating Co., of Tacoma, Wash.)

Telephone Receiver (1,273,351).—Desirable proportions of silicon steel cores for telephone receivers, damping constants, and permeability all feature in this patent, assigned to the Western Electric Co. by Halsey A. Frederick, of Hackensack, N. J.

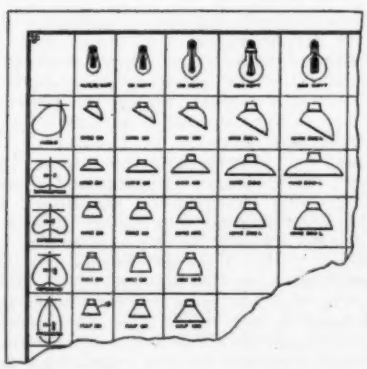
Making Tungsten Wire (1,273,506).—In making wire from tungsten, Anton Lederer of Vienna covers the tungsten with sulphur, which serves both as a protection against oxidation and as a lubricant. (Patent assigned to the Westinghouse Lamp Co.)

Rotating Field Magnets (1,273,385 and 1,273,511).—Several new features in slotted rotating magnets are shown in these two patents, both issued jointly to Birger Ljungstrom (of Stockholm) and Fredrik Ljungstrom of Brevik, Sweden.

Radio-Signaling (1,273,431). — According to this patent (assigned by Roy Alexander Weagant, of Roselle, N. Y., to the Marconi Wireless Telegraph Co.) a plurality of sections having distributed capacity and inductance are connected into a single antenna. Oscillations are then set up in the open antenna by repeated applications of impulses of a desired frequency, and reactions opposed to oscillations of undesired frequencies are set up at points distributed substantially throughout the length of the antenna.

Protecting Electric Systems (1,273,444).—In protecting a system of distribution which includes a number of feeders, Elmer E. F. Creighton uses solenoids arranged so as to receive current only under abnormal conditions, and uses an armature controlled by the solenoids for closing a proper circuit, the solenoids and the armature being so designed that similar abnormalities in the feeders produce stresses inversely proportional to the electrostratic capacity of the feeders.

Light Distribution Chart. (1,268,440).—To expedite the selection of the proper reflectors for use with given lamps in securing any one of a number of typical distribution curves, Henry D'Olier, Jr. (of Bridgeport, Conn.) has arranged and patented a chart in which each reflector appears vertically in line with a lamp suitable



No. 1,268,440.—Light Distribution Chart.

for it, and horizontally in line with the type of distribution curve obtained by using such a lamp with such a reflector.

Men in Service

Guy E. Tripp Made Brigadier General—Lieutenant E. K. MacDonald Cited by French Government—Other Notes

N. P. Bray, of the Sapulpa (Okla.) Electric Company, has joined the Army.

G. Harold Davis, former chief bookkeeper of the Danbury & Bethel Gas & Electric Light Company, has been made secretary, succeeding H. A. Louwein, now with the War Industries Board in Washington.

Charles M. Rogers, results engineer for the Southern district of the H. L. Doherty Organization for a number of years, has joined the Government dollar-a-year brigade. He will have the title of fuel oil engineer of the Gulf Coast district, with headquarters in New Orleans. Work for Uncle Sam began about September 1.

Keene Richards, captain in the Signal Corps Reserve, has been promoted to the rank of major. In civil life Major Richards was a division superintendent for the Public Service Company of Northern Illinois with headquarters at Chillicothe, Ill. He entered the army as a lieutenant, being advanced in a short time to captain.

Alton W. Leonard, president of the Puget Sound Traction Light & Power Company, Seattle. has been appointed by chairman of the national board a member of the National Committee of War Camp Community Service. A plan is now being considered to merge the war camp community work with the American Library, Y. M. C. A. and Y. W. C. A. Mr. Leonard is chairman of the War Camp Community Board and is to organize a state executive committee under the new merger plan and sit in conference with representatives of other agencies.

Guy E. Tripp, formerly colonel U. S. A. and head of Production Division of the Ordnance Department, has been made Brigadier General U. S. A. and placed in charge of the administration work of the eleven district ordnance offices having charge of the production of ordnance material in their respective sections of the country. The district chiefs will report direct to General Tripp, who is succeeded as head of the Production Division by Colonel C. G. Jamieson. Previous to his connection with the Ordnance Department General Tripp was chairman of the Board of the Westinghouse Electric & Manufacturing Company with headquarters in New York. General Tripp becomes chief assistant to General C. C. Williams, who has appointed four other assistants to act for him in the general supervision of all department activities. Heretofore, the division chiefs have reported directly to the Chief of Ordnance, each being familiar only with the plans and progress of the work under his supervision. For example, the chief of the Engineering Division could report as to the plans made in his division for any ordnance material but would not be conversant with the plans or progress of the Production, Inspection or Supply Divisions for this material. The appointment of the assistants will, therefore, insure all of this information being centralized in one individual who will act as the representative of the Chief of Ordnance exercising supervision over all the activities of the particular line of ordnance material which may be assigned to him. It will

Gen. Guy E. Tripp.

be the function of the assistants to decide all engineering, manufacturing and inspection matters concerning the respective ordnance material over which they have supervision, and where differences of opinion arise between various divisions they will make the necessary decisions. One of the particular duties of these assistants will be the observation of low points in the manufacturing program and securing the adoption of necessary measures for their correction.

ROLL OF HONOR.

The electrical industry, perhaps to a greater extent than any other industry, has answered the call of the Nation for Men. As this is a war of engineers, naturally the technically trained men in the electrical industry have been in great demand and they have responded with splendid patriotism. Many of the large utility and industrial corporations have assigned men for Government service aside from those who have voluntarily entered or been called for service.

The Electrical Review *will welcome news concerning men who have entered the service or who are engaged in any patriotic duties.*

Lieutenant C. E. Norenberg, formerly of the Engineering Department of H. M. Byllesby & Company, Chicago, has been commissioned captain.

W. B. Miser, manager of the Drumright Division of the Oklahoma Gas & Electric Company, has received a commission as captain in the Engineers Corps of the United States Army and will leave shortly for a cantonment.

C. M. Stebbins, of the C. E. Mills Oil Company, Syracuse, N. Y., who was recently appointed combustion fuel oil engineer in the oil division of the United States Fuel Administration, will serve as inspector of the fuel burning plants in New York west of Syracuse to Buffalo, and as far as Erie, Pa.

Northwestern Electric Equipment Company, St. Paul, Minn., shows 36 names of employees on its latest service roll. Many are engaged in electrical work either in the Signal Corps or in the Navy. One employee, G. C. Rosness, has died in the service.

H. C. Deffenbaugh, for the last year and a half assistant to the Secretary of the Empire State Gas and Electric Association, has been commissioned first lieutenant, Corps of Engineers, United States Army and assigned to the Searchlight Section, 56th Engineers, Washington Barracks, Washingston, D. C.

Electric Supply Company, Memphis, Tenn., prominent electrical jobbers of the South, report 10 men in active Government service, as follows: Jack McNish, William A. White, Don B. Rutledge, Robert Prather, M. A. Patterson, Vernon A. Watson, Conley M. Harris, William A. Grills, N. H. Spindler, and Henry G. Mitchell, Jr.

Lieutenant E. K. MacDonald, formerly of the bond department of H. M. Byllesby & Company, Chicago, has been cited by the French Government for great courage and a high sense of duty. He has been awarded the croix de guerre and the citation reads in part: "Lieutenant MacDonald is an officer pilot of great courage, possessing a high sense of duty. He has taken an active part in the battles of the Aisne and in Picardy, executing with remarkable activity ten bombardments on the battlefield in spite of attacks of enemy aeroplanes and accurate artillery fire. On August 11, in the course of a bombardment on a battlefield, he brought down an enemy machine which crashed to the ground." Lieutenant MacDonald received his aviation ground work at Urbana, where he was one of ten honor men. He was sent to Italy for his preliminary and final training as a flyer. He was commissioned a first lieutenant last March. He went to the front with the French squadron, to which he is attached, early in July. He made his first flight over the enemy lines in the region of Chateau Thierry, July 15.

Personal

W. H. Morton General Manager of Contractor-Dealer Association—Drayer Secretary Association of Engineers

C. J. SCHULTZ has been promoted to the position of superintendent of the Bernardsville territory of the New Jersey Power & Light Company to succeed John MacLean, resigned.

D. P. CARTWRIGHT has been appointed manager of the New York branch of the North East Electric Company to succeed R. J. Hardacker, who is shortly to assume the management of the Chicago branch.

JUDGE FRANK SMATHERS, Atlantic City, N. J., has been appointed receiver for the Pleasantville Electric Company, Pleasantville, N. J., operating in Pleasantville, Absecond, Northfield, Linwood and Somerspoint.

JOHN WOOD, of the engineering department of the Remy Electric Company, Anderson, Ind., has associated himself with the Midwest Motors Company, of Indianapolis, recently organized by S. A. Fletcher.

J. A. SCHABECK, formerly an assistant superintendent for the Public Service Company of Northern Illinois at Ottawa, Ill., has been appointed superintendent of Division L, comprising Chillicothe, Henry, Lacon, LaRose, Sparland and Varna.

GEORGE V. W. INGHAM, who has been a field representative for the Bryant Electric Company in the central western territory for several years past, has been appointed Eastern sales manager, with headquarters at the factory, Bridgeport, Conn. Mr. Ingham will direct the sales activities of the company in the territory east of Allegheny Mountains.

F. D. PHILLIPS, formerly vice-president of the Central Telephone & Electric Company, 310-312 North Eleventh Street, St. Louis, Mo., at a special meeting of the directors held August 15, 1918, was elected president, to succeed J. S. Cuming, who has resigned and disposed of his holdings in the Central Telephone & Electric Company. At the same time the Central Telephone & Electric Company announces that it has disposed of its manufacturing interests and will confine its efforts to the electrical jobbing business. Their new policy has greatly increased its warehouse space and enables it to carry larger stocks of the products of those manufacturers the company represents.

ROBERT V. PRATHER, at a joint meeting of the Illinois State Electric Association and the Illinois Electric Railways Association, held in Chicago on August 16, was elected joint secretary of the two Associations, effective September 1. Mr. Prather, who was formerly secretary of the Illinois Public Utilities Commission, will devote his entire time to the two Associations. The headquarters of the Associations will be located at Rooms 304 and 306 DeWitt Smith Building, Springfield, Ill. Mr. Prather, for the past five years, has been secretary of the Public Utilities Commission, having been appointed secretary by Governor Dunne a few weeks after the Commission was inaugurated in office, January 1, 1914, and served through the Dunne administration and was reappointed secretary by Governor Lowden on July 1, 1917, resigning the position July 15, 1918. Prior to his connection with the Utilities Commission Mr. Prather was western solicitor for a large New York brokerage house.

S. F. BOND, electrical engineer of the Binghamton Light, Heat & Power Company, Binghamton, N. Y., who came to Binghamton about a year and one-half ago, has resigned his position with the company. His place has been filled by W. B. Goudy, formerly superintendent of the New Kensington Light & Power Company, of New Kensington, Pa. The entire electrical equipment, including the power plant and substations, will be under Mr. Goudy's jurisdiction, as well as the plant of the Sayre Electric Company, Sayre, Pa.

C. E. DRAYER, of Cleveland, Ohio, who has been actively engaged in engineering work of a local and national character for the past eight years, has been appointed secretary of the American Association of Engineers. After having been graduated from college in Cleveland, Ohio, he served on western railroads until 1910, when he returned to Cleveland, to become field engineer for the Nickel Plate Railroad on grade elimination work. He immediately joined the Cleveland Engineering Society and, as opportunity offered, took measures to advance the engineer in public esteem and to encourage him to train himself to be a leader in service to the community. After two years of marked success in the local society in Cleveland, he began to carry the message of progress to other societies and in time addressed most of the engineering organizations east of the Mississippi. In 1915 he became associated with Dr. F. H. Newell in forming the Committee on Engineering Cooperation of which he is secretary. He organized and is secretary of the Ohio Association of Technical Societies. He is co-editor of "Engineering as a Career," a series of articles of advice to young men. For several years Mr. Drayer was editorial correspondent for Engineering News and Engineering News Record in which most of his articles on engineering society organizations have appeared. He served the Cleveland Engineering Society as its secretary for two years and was a member of its executive board when elected secretary of the American Association of Engineers. He formulated the plan of combining the membership of the American Association of Engineers and Cleveland Engineering Society which promises to have a profound influence on engineering organizations.

GEORGE WILLIAMS, new business manager of the Doherty Organization, who was recently made a director of Cities Service Company, has now the additional title of vice-president of Crew Levick Company.

W. H. MORTON, formerly secretary of the National Electrical Contractors' Association of the United States, has been appointed general manager of the reorganized National Association of Electrical Contractors and Dealers, effective August 15. General Manager Morton is a pioneer association man. When the few contractors met in Buffalo back in 1901 for the purpose of organizing a national body, Mr. Morton, then an electrical contractor of Utica, was present. He was active in getting the contractors together for that first meeting and really was responsible in a large measure for the final organization of the National Association. He was first elected temporary secretary of the meeting and later permanent secretary of the national organization. In this capacity he served zealously and untiringly until the year 1913 when at Chattanooga he tendered his resignation as secretary of the National and business manager and editor of its official journal, the *Electrical Contractor-Dealer*. It was with regret that the executive committee accepted his resignation, but Mr. Morton had become interested in an enterprise in Porto Rico to which it was necessary to devote his entire time. The convention assembled at Chattanooga passed a resolution extending the appreciation of the organization for his untiring efforts. Mr. Morton's new duties will be broader than those of former years in that he will be responsible for the conduct of all the work of the National organization in its enlarged field. His new work will in no way interfere with the work the present secretary, Mr. Brown is doing. The latter will be of material assistance to General Manager Morton in his work because of his intimate knowledge of more recent Association activities.

Obituary.

ELBERT B. PECK, vice-president and controller of the Indianapolis Traction & Terminal Company and of the Terre Haute, Indianapolis & Eastern Traction Company, died, August 24, following a long illness from a tumerous growth on the lungs. Mr. Peck had been associated with the Indianapolis Traction & Terminal Company since he went to Indianapolis from Kansas City, Mo., in 1899, with Hugh J. McGowan, then president of the company. He was made vice-president of the company in 1906. He was also a director of the Terre Haute Traction & Light Company. He was at one time president of the Central Electric Railway Association.

Financial News

$33,400,000 New Interborough Notes.

The Interborough Rapid Transit Company has arranged to sell to a syndicate of bankers $33,400,000 three year 7 per cent secured convertible notes, due Sept. 1, 1921. They are being offered for investment at 98½, to yield a little more than 7½ per cent.

The notes are secured by deposit of $52,187,000 first and refunding 5 per cent bonds of the company, so that the notes amount to only 64 per cent of the deposited bonds. The notes will be convertible at maturity into the bonds at 87½.

The War Finance Corporation, it is stated, has agreed to take 36 per cent of the note issue if necessary to make the issue a success.

Such of the notes as are taken by the syndicate, not to exceed $12,500,000, are to be sold to the public proportionately with those taken by the syndicate.

The distributing syndicate is headed by J. P. Morgan & Company and includes the First National Bank of New York, the National City Company, the Harris Trust & Savings Bank, Lee, Higginson & Company, Halsey, Stuart & Company, and Kissell, Kinnicutt & Company.

Large Traction Bond Offering.

An offering of $5,500,000 7 per cent general mortgage bonds of the Monongahela Traction Company is being made by the National City Company of New York. The bonds are for five years and are offered at a price to yield about 7¾ per cent.

Dividends.

The board of directors of Standard Gas & Electric Company has declared the regular quarterly dividend of 1½ per cent on the preferred stock of the company, payable September 14 to stockholders of record August 31.

The Board of Directors of the Oklahoma Gas & Electric Company has declared the regular quarterly dividend of 1¾ per cent on the preferred stock of the company, payable September 14 to stockholders of record August 31.

The board of directors of the Muskogee Gas & Electric Company has declared the regular quarterly dividend of 1¾ per cent on the preferred stock of the company, payable September 14 to stockholders of record August 31.

The Board of Directors of the Arkansas Valley Railway Light & Power Company has declared the regular quarterly dividend of 1¾ per cent on the preferred stock of the company, payable September 14 to stockholders of record August 31.

The General Electric Company has declared the regular quarterly cash dividend of 2 per cent, payable October 15 to stock of record September 14.

The Northern Ohio Electric Corporation declared the regular quarterly dividend of 1½ per cent on the preferred stock, payable September 3 to stock of record August 20.

Rochester Railway & Light Company has declared a quarterly dividend of 2½ per cent on preferred stock, payable September 3 to stock of record August 26.

The Northern Texas Electric Company has declared a semi-annual dividend of $3 a share on the preferred stock and a dividend of $2 a share on the common stock, both payable September 3 to stockholders of record at the close of business August 19.

Federal Utilities Company, Inc., has declared a quarterly dividend of 1½ per cent on preferred stock, payable September 3 to stockholders of record August 15.

Philadelphia Electric Company has declared a quarterly dividend of 1¾ per cent, payable September 14 to stock of record August 20.

NORTHERN OHIO TRACTION.

The Northern Ohio Traction & Light Company reports for twelve months ended July 31 last:

		Increase.
Gross earnings	$6,813,328	$ 865,515
Net income	1,313,854	*202,399
Net after dividends	1,012,161	*221,452
Balance after charges	777,161	*221,452

*Decrease.

PHILADELPHIA COMPANY.

For July—		Increase.
Gross	$1,983,148	$ 356,816
Net	770,102	151,831
From April 1:		
Gross	8,150,331	1,234,071
Net	3,494,309	418,001

PACIFIC GAS & ELECTRIC.

In Pacific Gas & Electric Company's June gross earnings were $1,860,815, compared with $1,663,832 for June, 1917; net, after taxes, including miscellaneous income, $783,781, compared with $747,083; surplus after charges and preferred dividends, $300,548, compared with $257,849.

UTAH SECURITIES.

The properties now controlled by the Utah Securities Corporation, intercompany charge eliminated, reports for July:

		Increase.
Gross earnings	$ 566,725	$ 70,550
Net earnings	311,179	23,133
For 12 months—		
Gross earnings	6,944,148	790,133
Net earnings	3,740,211	378,112

AMERICAN PUBLIC UTILITIES.

The income account for the year ended June 30, with comparisons, follows:

	1918.	1917.
Gross earnings	$4,452,125	$3,819,[illegible]
Net earnings	1,657,381	1,668,[illegible]
Gross income	1,738,084	1,760,[illegible]
Net income	1,626,504	1,688,[illegible]
Balance after charges	249,649	215,[illegible]

AMERICAN POWER & LIGHT.

For July—		Increase.
Gross earnings	$1,033,718	$ 179,[illegible]
Net earnings	383,058	30,[illegible]
For 12 months—		
Gross earnings	12,438,283	1,510,[illegible]
Net earnings	5,026,079	277,[illegible]

THE NORTHWESTERN OHIO RAILWAY & POWER.

The business of the railroad department, both passenger and freight, has shown a substantial increase during the past two months. This, with the increased rates now in effect has improved operating results, as shown by the following figures:

			—Increase—	
June—	1918.	1917.	Amt.	Per cent.
Operating revenue	$32,474	$25,714	$6,760	26.3
Operating expenses and taxes	24,379	23,876	503	2.0
Operating income	$ 8,095	$ 1,838	$6,257	344.0
July—				
Operating revenue	$40,681	$28,781	$11,900	41.3
Operating expenses and taxes	28,107	24,612	3,495	14.2
Operating income	$12,574	$ 4,169	$8,405	201.0

WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeiler & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid Aug. 27.	Bid Sept. 3.
Adirondack Electric Power of Glens Falls, common	6	13	13
Adirondack Electric Power of Glens Falls, preferred	6	68	68
American Gas & Electric of New York, common	10+extra	81	81
American Gas & Electric of New York, preferred	6	37	37
American Light & Traction of New York, common	..	184	182
American Light & Traction of New York, preferred	6	91	91
American Power & Light of New York, common	4	40	40
American Power & Light of New York, preferred	6	66	66
American Public Utilities of Grand Rapids, common	..	..	..
American Public Utilities of Grand Rapids, preferred	6	..	..
American Telephone & Telegraph of New York	..	98½	98
American Water Works & Elec. of New York, common	..	4½	4⅝
American Water Works & Elec. of New York, particip	7	12	12
American Water Works & Elec. of New York, first preferred	..	57	57
Appalachian Power, common	..	3	3
Appalachian Power, preferred	7	21	21
Cities Service of New York, common	+extra	209	208
Cities Service of New York, preferred	6	72½	72
Commonwealth Edison of Chicago	8	103	101
Comm. Power, Railway & Light of Jackson, common	..	22	20
Comm. Power, Railway & Light of Jackson, preferred	6	42	40
Federal Light & Traction of New York, common	..	7	7
Federal Light & Traction of New York, preferred	..	35	35
Illinois Northern Utilities of Dixon	6	..	..
Middle West Utilities of Chicago, common	2+extra	17	15
Middle West Utilities of Chicago, preferred	6	37	35
Northern States Power of Chicago, common	..	43	43
Northern States Power of Chicago, preferred	ex.div.7	80	81
Pacific Gas & Electric of San Francisco, common	..	34	34
Pacific Gas & Electric of San Francisco, preferred	6	79¼	79¼
Public Service of Northern Illinois, Chicago, common	7	75	75
Public Service of Northern Illinois, Chicago, preferred	6	83	82
Republic Railway & Light of Youngstown, common	4	20	19
Republic Railway & Light of Youngstown, preferred	6	57	57
Standard Gas & Electric of Chicago, common	..	4½	4⅛
Standard Gas & Electric of Chicago, preferred	6	22	21
Tennessee Railway, Light & Power of Chattanooga, common	..	2½	2
Tennessee Railway, Light & Power of Chattanooga, preferred	6	13	12
United Light & Railways of Grand Rapids, common	4	29	28
United Light & Railways of Grand Rapids, preferred	6	61½	60
Western Power of San Francisco, common	..	13	12
Western Power of San Francisco, preferred	6	48	48
Western Union Telegraph of New York	extra	73	84
Industrials—			
Electric Storage of Philadelphia, common	4	52	52
General Electric of Schenectady	8	146	147
Westinghouse Electric & Mfg. of Pittsburgh, common	7	43½	44¼
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	61	61

*Last sale.